AWM
ASSOCIATION FOR WOMEN IN MATHEMATICS

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President's Report

Leadership

The objective of this month's column is to draw attention to a new report, "Women for science: An advisory report," written by a panel co-chaired by Johanna Levelt Sengers and Manju Sharma and issued by the InterAcademy Council in June, 2006. The report makes a case for the need for more women to be represented in the highest positions of the scientific enterprise—in positions of leadership. It also outlines strategies for achieving this. But I want to start with some personal thoughts.

I have an early memory from elementary school, of an event that must have occurred frequently. The entire school would be seated in the auditorium, at what used to be called an assembly, and we would hear presentations by some dignitary—possibly a politician, maybe even the Mayor of Ottawa, or perhaps a member of the school board. This dignitary would address his remarks to us, referring to us, then six or ten years old, as "the leaders of tomorrow." The time was the beginning of the Cold War, which Canada took very seriously; and leadership—in democracy, freedom, and, after 1957, science—was a goal instilled in Canadian youth from an early age. But I well remember thinking that these inspiring remarks referred to others, not to me. After all, I was a girl, and leaders were male. Of course, I don't know what excuses my fellow-students made. It's quite possible that they, listening to exhortations to duty and effort, just said, "This is for other energetic people. I'm only in Grade Four and I'm going to play a bit longer!" Perhaps requests to consider this career route need to be made age-appropriate, as well as gender-appropriate.

Nonetheless, if it took a long time for the idea of playing a leadership role to occur to me, it's possible that lack of role models and absence of encouragement of women were partly responsible. And that motivates the second personal comment: a statement of gratitude to AWM and its leadership for giving me the opportunity to serve as your president. It's too soon for a valedictory column, but not too soon to point out what an amazing opportunity this is for leadership. In my case, it occurred almost simultaneously with a very different opportunity—to become Director of the

IN THIS ISSUE

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ASSOCIATION FOR WOMEN IN MATHEMATICS

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.

Fields Institute—and this has provided almost an embarrassment of riches. But the unique challenges of being president of a volunteer organization have given me unprecedented directions for growth and learning. It's rather awkward to have to admit that I'd not done very much to deserve this gift from AWM, beyond a few very minor committee assignments. And because there's more to the job than standing at the front of the room and making gracious remarks and getting your picture taken, it's quite possible that the people who handed me the position thought they were getting rid of a burden rather than doing me a favor. But from the viewpoint of a leadership position for a woman, and a visible position in the mathematics community, this is a plum, and I applaud the pioneers of this association, who set it up, along with all the other goals for the advancement of women in mathematics that form the mission of AWM.

And this brings me to the Sengers-Sharma report, which I discovered thanks to a short article in the June 30, 2006 issue of *Science* magazine. The report is relatively brief—75 pages, including all appendices, and it covers the whole world, so that a long chapter is devoted to strategies for empowering women in science in developing countries. It takes as its motivation a world-wide shortage of scientists, and it poses a dramatic choice: educate women for science, or live in poverty! The panel that wrote the report did no studies of its own, but read and evaluated a large number of previous studies, carried out in a number of countries, by governments and private organizations. The report does not waste much time on the "Summers hypothesis"; the authors mention it but then state, "Yet although there is a substantial body of psychological and brain research that verifies some differences between men's and women's mental processes, these differences have not been linked conclusively to S&T aptitude." Then, because the report is a recommendation for action, not a survey, it reviews approaches taken by different organizations and in different countries to increase the participation of women. The authors give numerous examples of special programs, but they conclude that the single most effective approach is what they call *good management practice*. This terminology may be unfamiliar in North America: I think we would be more likely to say "best practices" or call for "changing the institutional culture." The authors recommend this above special programs (though they also encourage those). In fact, the report states, "It is worth noting, however, that good management practice, once implemented, will eliminate much of the need for special programs because their provisions will have been built into the organizational structure, thereby benefiting all employees."

One example of the refreshing viewpoint of this report is its treatment of the work-family balance, often cited as a burden that falls more heavily on women, as women try to adapt to the workplace. Not so, implies the report: the problem is with the workplace, which needs to adapt to balance work and family responsibilities by means of measures like child-care and flexible work schedules. The report addresses its recommendations to a number of institutions, but overall it criticizes rather severely the most distinguished national scientific bodies—national academies—because they are often much less balanced

than the demographics of a field would suggest. For example, the Board of the InterAcademy Council, which commissioned the report, consists of 15 male leaders of national academies. But the good practices that the panel recommends include infrastructure changes that can be implemented by an institution at any level:

- Establish a committee that addresses gender issues and ensures follow-up.
- Promote women members to decision-making levels and include them in panels and committees.
- Increase the number of women scientists in the nomination pool for membership, prizes and awards.
- Give visibility to women scientists and represent women in the academy's portrayal of science.
- Ensure that the criteria for evaluation of research institutes include organizational culture.

Expressing what must have been the frustrating discovery that many institutions simply do not maintain data on the participation rates of women, the authors also put in a strong plea for collecting gender-disaggregated data. Repeatedly, they urge that the panels that decide on grants and awards be gender-balanced. They put in a strong word for mentoring, and for transparency, which seems to be the key component of good management. Perhaps a document like this, which had to be approved by innumerable committees before it could be circulated by the InterAcademy Council (an entire chapter is taken up with a description of the reviewing process), could see the light of day only once it had been purged of ideology and judgment. In any case, it is remarkably free of blame or speculation about how we got into this fix. For women scientists everywhere, and for the members of AWM, it is a call to action. Think big: leadership awaits you.

Meetings and Events

Spring and summer brought a full program of AWM events. Recurring events include the ONR-sponsored mentoring workshop at the SIAM meeting, organized this year by Suzanne Lenhart, Renee Fister, Kristen Moore and Jennifer Ryan, the Kovalevsky lecture at the same meeting (this year's speaker was Irene Fonseca), and the Falconer lecture at the MAA's MathFest (this year featuring Trachette Jackson). More details about all

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See the AWM website for details.

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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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Website and Online Forums
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oleary@cs.umd.edu

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

AWM DEADLINES

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:
October 15, 2006 (note deadline change)
AWM Essay Contest: Biographies of Contemporary Women in Mathematics:
November 3, 2006
AWM-SIAM Workshop: December 15, 2006
Sonia Kovalevsky High School Mathematics Days: February 4, 2007

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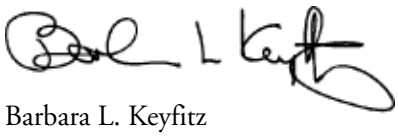
these events may be found on the AWM web page and in the meeting programs on the societies' web pages [see pages 6–8 for a report on the SIAM meeting and next issue for a report on MathFest]. In addition, AWM and MSRI, with a generous grant from NSA, ran the "Olgas workshop" at MSRI in May: a three-day meeting celebrating the scientific and personal legacy of Ladyzhenskaya and Oleinik, with Susan Friedlander chairing the organizing committee. I reported briefly on this event last issue, and a report by Bettye Anne Case appeared on pages 10–15.

This meeting, also known as "Olga-squared," featured outstanding research talks by women at all career stages, as well as posters, career development panels, and a very moving set of reminiscences of both Olgas by their friends, Russian and American. There was even a video made by Nina Uraltseva ("the first movie I ever made—and the last!") at the ICM in Nice (1970) that included a scene of Cathleen Morawetz and Olga Ladyzhenskaya swimming together and talking (hydrodynamics, obviously) on the beach. The recognition by the younger women in the room of the legacy of these outstanding women; the sense of their struggles and their personal sorrows; and the understanding that behind their phenomenal talent they were women like us, all lent the event an emotional weight. This, also, was leadership.

Thank You, Ginger

Many thanks to Ginger for her years of service as Education Column Editor! Virginia Warfield, who is a Senior Lecturer in the Mathematics Department of the University of Washington, took over her role in late 1997; her first column appeared in the January–February 1998 issue. Although there have been many columns written by others during her tenure (including our President-Elect Cathy Kessel), Ginger has written the lion's share of the columns herself. When she announced that she was stepping down, she turned out to be irreplaceable as editor. Instead, a committee put together by Cathy as Chair of the Education Committee will be sharing the writing of six columns per year. We are pleased that Ginger's delightful and thought-provoking columns will not disappear altogether from the newsletter, they'll just appear on a less regular basis. She has already written one of the first two columns appearing under the new system! Thank you, Ginger, for leading us here.



Barbara L. Keyfitz
Toronto, Canada
July 26, 2006

AWM EC Action

Alice Silverberg, Member-at-Large, UC Davis

The AWM Executive Committee passed a motion in July authorizing the AWM President to send letters to conference, workshop, or program organizers informing them of the benefits of diversity on program committees and speaker lists and giving suggestions for how to accomplish this. While the primary intended recipients are organizers of conferences or workshops for which the speaker list appears to have a noticeable lack of diversity (especially gender diversity in fields in which one would expect many more women to be on the list), the motion gives the president discretion to send such a letter whenever she considers it appropriate. The hope is that raising awareness now will lead to improvements when the same people organize events in the future.

The AWM Executive Committee encourages members to contact the AWM President (currently Barbara Keyfitz at bkeyfitz@fields.utoronto.ca) with the following information:

- names and contact information of organizers you would like to be contacted,
- links to relevant conference or program information (including speaker lists), and
- any relevant background information on why such a letter might be appropriate or helpful in this circumstance.

SACNAS Conference

The Society for Advancement of Chicanos and Native Americans in Science (SACNAS) will hold its annual conference in Tampa, FL. October 26–29, 2006. "Science Revolution in Minority Communities: What Progress Have We Made?" offers a national forum for investigation of questions related to the theme and the development of a new generation of leaders who will be instrumental in shaping future directions and applications of scientific research. For more information on the conference see http://www2sacnas.org/confNew/confClient/.

Teacher Partnership Program

AWM press release

The Association for Women in Mathematics (AWM) is pleased to announce its new Teacher Partnership Program. The program is intended to link teachers of mathematics in schools, museums, technical institutes, two-year colleges, and universities with other teachers working in an environment different from their own and with mathematicians working in business and industry. It will pair a teacher (classroom or informal setting) with a mathematician, matching members from different communities. Some examples of how these collaborations may arise are given here:

- a university instructor may request a teacher from a school to visit her class for prospective teachers;
- a high school teacher may ask to partner with a mathematician working in industry;
- a children's museum activity programmer may want to partner with a mathematician;
- a teacher in a school may cooperate with a mathematician for after-school activities.

Partnership activities may include:

- electronic discussions;
- teaching projects;
- classroom visits when feasible;
- informal educational activities.

In addition to electronic communications, partners may visit each other's classrooms, collaborate in teaching projects, or cooperate in writing grant proposals.

The AWM Teacher Partnership Program will maintain a website for the purposes of sharing resources and information.

Eligibility: Anyone who is engaged or interested in contributing to the formal or informal mathematics education of students at any level may request a partner in a particular area of interest or from any level.

We invite individuals to join the partnership. For more information, please visit the AWM website at www.awm-math.org and click on *Teacher Partnership Program.*

AWM at the 2006 SIAM Annual Meeting

Jennifer Quinn, AWM Executive Director

This year, the SIAM Annual Meeting was held in Boston, MA from July 10–24, 2006 in conjunction with the activity group meetings on Analysis of Partial Differential Equations and Financial Mathematics and Engineering. Housed in the historic Boston Park Plaza Hotel, plenary lectures were delivered on the proscenium stage in the Imperial Ballroom with sparkling crystal chandeliers and gilded balconies. Whether it was the location or the topic, this meeting attracted a record number of mathematicians—over 1100.

Another remarkable fact, in addition to the attendance, was that twenty-five percent of the invited lecturers were women. **Marsha Berger**, Courant Institute, spoke on "Embedded Boundary Methods: Where do Things Stand?" Berger reviewed the current state of the field, including the issue of stability in the presence of small irregular cells and discretizations for moving bodies. The talk concentrated on her work involving aerodynamic flows and ended with a discussion of open problems. **Andrea Bertozzi**, UCLA and Duke University, spoke on "Higher Order PDEs: Analysis and Applications." Bertozzi reviewed state of the art analytical techniques for higher order nonlinear PDEs, showed how they lead to the design of numerical methods, and provided illustrative applications to image processing requiring the removal of small-scale features while preserving and detecting edges and corners. **Yi Jiang**, Los Alamos National Laboratory, lectured on "A Multiscale Model for Tumor Growth." Jiang's model for cancer cell dynamics incorporates cell growth, cell division, cell death, cell-cell adhesion, an intracellular protein regulatory network for cell cycle control, and extracellular reaction-diffusion chemical dynamics. This model has produced tumor growth dynamics that agree with tumor spheroid experiments and generated hypotheses on tumor biology that can be tested by experiments. The model framework can potentially predict tumor development and effects of therapies. **Barbara Keyfitz**, The Fields Institute and University of Houston, titled her talk "Multidimensional Conservation Laws"—though she offered ten alternate titles during her lecture including "Why We Need Theorems," "50 or 60 Years of Frustration," and "The Ferment in Similarity Methods." Keyfitz explained that a concerted effort has been underway to formulate a theory of multidimensional conservation laws for the past fifteen years. Several approaches appear promising, including the study of functions with very weak regularity properties and the analysis of self-similar problems. Finally, **Irene Fonseca**, Carnegie Mellon University, delivered the AWM-SIAM Sonia Kovalevsky Lecture: "New Challenges in the Calculus of Variations." Motivated by issues in the physical sciences and engineering, Fonseca takes a variational approach to treat problems on foams, imaging, micromagnetics, and thin structures.

Women also made a strong appearance during the concurrent sessions. Of particular note were the minisymposia "Women at the Interface of Mathematics and Biology" featuring talks by **Ami Radunskaya**, Pomona College; **Cymra Haskell**, UCLA; and **Erika Camacho**, Loyola Marymount University and "Computational Aspects of Sensitivity Analysis for Control Problems" featuring talks by **Lisa G. Davis**, Montana State University; **Faranak Pahlevani** and Lisa G. Davis, Montana State University; **Lizette Zietsman**, Virginia Polytechnic Institute & State University; and Belinda A. Batten and **John Singler**, Oregon State University.

The AWM Workshop for Women Graduate Students and Recent Ph.D.'s was organized by **Kristen Moore**, University of Michigan; **Suzanne Lenhart**, University of Tennessee; **Jennifer Ryan**, Virginia Polytechnic Institute and State University; and **Renee Fister**, Murray State University. The workshop began on Monday with the minisymposium "Staying on Top of Your Game in Research and Teaching." The speakers each brought their unique and personal perspective to the eternal issue of balancing teaching and research responsibilities. The take-home lesson seemed to be prioritize, be realistic, organize, use common sense, and be open to new ideas and nontraditional paths. **Sigal Gottlieb**, Brown University, stressed the importance of lists and organization while "Juggling Eggs." **Mary Ann Horn**, Vanderbilt University and National Science Foundation, shared her own career trajectory in "Smooth Transitions and Turbulence: Shifts between Professor and Administrator." **Smadar Karni**,

University of Michigan, urged prioritization and realism while "Developing a Commonsensical Approach to an Academic Career." **Renee Fister** used sports analogies and props to illustrate "Playing the Game: What I Have Learned."

The workshop dinner on Monday night was the first opportunity for graduate and post doctoral participants to meet with their mentors. The evening included dinner, informal advice, and a presentation by **Erica Voolich**, middle school teacher, winner of a Presidential Award for Teaching Excellence, and founder of the Somerville Math Fund—a "mathematical charity" that provides math scholarships in the local community of Somerville, MA, and encourages math learning through teacher grants, Family Math Nights, and family problem solving in the local newspaper.

The workshop continued on Tuesday with presentations by postdoctoral participants in one of two minisymposia.

Numerical and Model Development in Mathematical Biology

"Sensitivity of Dynamical Systems to Banach Space Parameters"
Hoan Nguyen, North Carolina State University

"Model Development and Evaluation for Trichloroethylene Metabolism in Humans"
Karen A. Yokley, University of North Carolina, Chapel Hill

"Superquadric Modeling in Computed Tomography Simulation"
Jiehua Zhu, Georgia Southern University

Physical Studies Relating to Partial and Integro-Differential Equations

"Hyperbolic Systems with Dissipation"
Cleopatra Christoforou, Northwestern University

"Patterns on Growing Square Domains via Mode Interactions"
Adela Comanici, University of Houston

"Irregular to Regular Sampling, Deconvolution, Denoising and Zoom"
Gloria Haro, University of Minnesota

"An Asymptotic Framework for Finite Hydraulic Fractures Driven by Multiple Physical Processes"
Sarah Mitchell, University of British Columbia, Canada

Twelve recent Ph.D.'s and graduate students presented AWM posters during the SIAM poster session and dessert reception. This concluded another successful AWM-SIAM workshop.

"A Mathematical Model of Network Dynamics Governing Sleep-Wake Patterns in Mice"
Cecilia Diniz Behn, Boston University

"A Hörmander-type Pseudo Differential Calculus on the Heisenberg Group"
A. Susana Coré Bianchi, State University of New York, Stony Brook

"An Edge Flame in a Mixing Layer"
Joanna Bieri, Northwestern University

"Mathematical Modeling of Cellular Signaling in Macrophages: Understanding Pathways"
Hannah Callender, Vanderbilt University

"Wellposedness and Control of Nonlinear Structural Acoustic Interactions"
Inger Daniels, University of Virginia

"Vacuum Formation in Multi-Dimensional Compressible Flows"
Kristen De Vault, North Carolina State University

"Improving Forecasts for Chaotic Physical Processes by Improving Initial Conditions"
Elena Klein Fertig, University of Maryland

"Front Dynamics of a Singular Perturbation Non-smooth Ignition Process"
Mohar Guha, Michigan State University

"Patterns of Synchrony in Lattice Dynamical Systems"
Yunjiao Wang, University of Houston

"Three Dimensional Computational Model of Water Movement in Plant Root Growth Zone"
Brandy S. Wiegers, Angela Cheer, and Wendy Silk, University of California, Davis

"European Option Pricing for a Stochastic-Volatility Jump-Diffusion Model"
Guoqing Yan, University of Illinois, Chicago

"Computational Studies of Morphogen Gradients"
Rui Zhao, University of California, Irvine

This workshop was made possible by funding from the Office of Naval Research and the work of volunteer organizers and mentors. A special thanks to Suzanne Lenhart, Mary Ann Horn, Renee Fister, Lizette Zietsman, Maeve McCarthy, Jennifer Ryan, Misha Kilmer, Kristen Moore, Cammey Cole, Smadar Karni, Trachette Jackson, and Barbara Keyfitz for their willingness to mentor and guide the newest generation of women mathematicians.

At this meeting, AWM members could self-identify by putting an AWM sticker on their name tag. Consider getting one of your own at the next national meeting.

Sonia Kovalevsky High School Mathematics Days

Through grants from Elizabeth City State University (ECSU) 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.

An additional selection cycle will be held in February 2007 for Spring 2007 using funds remaining after the August 2006 selection cycle. AWM anticipates awarding up to six additional grants ranging on average from $1500 to $2200 each ($3000 maximum per school) to universities and colleges. 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 February for high school days to be held in Spring 2007. If selected, a report of the event along with receipts (originals or copies) for reimbursement must be submitted to AWM within 30 days of the event or by June 1, 2007, whichever comes first. Reimbursements will be made in one disbursement; no funds will be disbursed prior to the event date.

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 **February 4, 2007**; applications via e-mail or fax will not be accepted.

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

For many years, the Association for Women in Mathematics has held a series of workshops for women graduate students and recent Ph.D.'s in conjunction with major mathematics meetings.

WHEN: The next summer AWM Workshop is scheduled to be held in conjunction with the Applied Dynamical Systems Meetings of the Society for Industrial and Applied Mathematics (SIAM) to be held in Snowbird, UT, from May 28 through June 1, 2007.

FORMAT: The workshop will consist of a poster session by graduate students and two or three minisymposia featuring selected recent Ph.D.'s, plus an informational minisymposium directed at starting a career. The graduate student poster sessions will include all areas of research, but each research minisymposium will have a definite focus selected from the area of applied dynamical systems or other areas of applied mathematics. AWM will offer funding for travel and two days subsistence for as many as twenty participants. 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. All mathematicians (female and male) are invited to attend the program.

DISCUSSION GROUP LEADERS: 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: To be eligible for selection and funding, a graduate student must have begun work on her thesis problem, and a recent Ph.D. must have received her degree within approximately the last five years, whether or not she currently holds a postdoctoral or other academic or non-academic position. All non-US citizens must have a current US address. All applications should include a cover letter, a summary of research work (one or two pages), a title and abstract (75 words or less) of the proposed poster or talk, and a curriculum vitae. A supporting letter of recommendation from a faculty member or research mathematician who knows their research is required for graduate student applicants and recommended but not required for recent Ph.D.'s. Additional letters of support are encouraged. All selected and funded participants are invited and strongly encouraged to attend the full AWM two-day program. Those individuals selected will be notified by the AWM Office and will need to submit a final title and abstract with name, affiliation, address, etc. to SIAM for the meeting program; AWM will provide instructions with the notification. 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 **December 15, 2006**. Applications via e-mail or fax will not be accepted.

Spelman College Honors Dr. Evelyn Boyd Granville:

A Trailblazer, A Teacher, A Tradition of Excellence

Tasha R. Inniss, Ph.D. and Sylvia T. Bozeman, Ph.D.[1]
Spelman College, Atlanta, GA

Introduction

On May 14, 2006, Spelman College (Atlanta, GA) awarded an Honorary Doctorate of Science degree to **Dr. Evelyn Boyd Granville** during its 119th Commencement Ceremony. When mathematicians hear the name *Evelyn Boyd Granville*, most will likely think "second African-American women to receive a Ph. D. in mathematics." This is indeed a remarkable place in history, especially given the fact that Dr. Granville received her Ph.D. from Yale University as recently as 1949 and was advised by Einar Hille, a mathematician of great prominence in classical and functional analysis. Most may not know of her stellar path to the Ph.D. and her subsequent productive career as a mathematician in both academic and non-academic settings.

In addition to Granville's historical accomplishment as the second African-American woman to earn the doctorate in mathematics, the celebration at Spelman College highlighted her pioneering work as a mathematician involved in the early orbital computations of the U.S. space program, her participation in efforts to end segregated practices associated with the professional mathematics societies, her contributions to education, and the inspiration she has given and continues to give to young women seeking careers in mathematics and science. It is no wonder that Spelman College, under the leadership of President Beverly Daniel Tatum, chose to recognize Granville by bestowing upon her its highest honor.

Dr. Granville and President Tatum
Left to right: Evelyn Boyd Granville, Mohammed Tessemma (Spelman math faculty member), Beverly Daniel Tatum

Education

Evelyn Boyd Granville, Professor Emerita of the California State College and University System, graduated summa cum laude in 1945 from Smith College where she was elected to Phi Beta Kappa. Her college education was funded in part by Phi Delta Kappa, a national sorority for Black women during those times. In 1946, she earned an M.A. in mathematics and physics, only one year after earning the A.B. in mathematics from Smith College. Financial support for her doctoral work at Yale University included a Julius Rosenwald Fellowship, intended to develop research potential in Blacks, and an Atomic Energy Commission Pre-doctoral Fellowship. Granville's dissertation was *On Laguerre Series in the Complex Domain.*[2]

Career

Dr. Granville had two productive careers, one as a college mathematics and computer science professor, with involvement in K–12 education. In 1950 Granville accepted a

[1] Sylvia Bozeman is a Professor of Mathematics and Tasha Inniss is an Assistant Professor of Mathematics at Spelman College. They are both committed to mentoring women in the mathematical sciences.

[2] Detailed biographies of Black Women Mathematicians are included on the website "Mathematicians of the African Diaspora." (http://www.math.buffalo.edu/mad/wmad0.html)

position as Associate Professor of Mathematics at Fisk University in Nashville, TN. Although it is often difficult to measure one's impact on students, two of her students from that first academic position, Vivienne Malone Mayes and Etta Zuber Falconer, became well recognized mathematicians and were among the first dozen African-American women to earn the doctorate in mathematics.

She entered a second career as a mathematician and computer programmer in various technical positions, most of which supported NASA's space programs of the 1960s. Granville wrote, regarding her work on the formulation of orbit computations, "I can say without a doubt that this was the most interesting job of my lifetime—to be a member of a group responsible for writing computer programs to track the paths of vehicles in space."[3]

In her academic career, Granville spent two years at Fisk University in Nashville (1950–1952), sixteen years at California State University in Los Angeles (1967–1983), and three and a half years at Texas College in Tyler, Texas (1985–1988).

Granville and Current Math Majors: From left to right: Rhonda Curtis (math major), Ashley Embry (graduating senior), Evelyn Boyd Granville, Morgin Jones (graduating senior), Kina McCanns (math major)

Activism

After accepting her first full-time teaching position in Tennessee, Granville found her efforts to participate fully in the mathematics community hindered by the segregation practices of the south. Following an unsuccessful attempt to attend a banquet of a national professional mathematics association in 1951, she joined in sending a letter to two major societies requesting action to end racial discrimination at events which they sponsored in order to protect the rights of all members to "participate fully, freely and equally in the affairs of the organizations without regard to race, creed or color."[4] Upon hearing the news that the honorary degree would be awarded, Professor Lee Lorch, who was chairman of the Fisk University Department of Mathematics at that time, commented on Evelyn Boyd Granville's actions in his congratulatory message to Spelman College. He wrote: "Evelyn Boyd's courageous and unhesitating willingness to face the issue was essential to that success, to opening doors previously locked. She was, so to speak, at the lunch counter of southern mathematical life." Lorch himself is a prominent mathematician who was an early civil rights activist and continues to fight for equal human rights.

Spelman Commencement Activities

During the May 2006 commencement activities of Spelman College, the community proudly welcomed and honored Dr. Evelyn Boyd Granville, who was awarded the Honorary Doctorate of Science degree. A Friday night reception at the home of President Tatum provided an opportunity for students, Atlanta faculty, and other guests to greet and celebrate the accomplishments of this historical figure. Undergraduate and graduate women, aspiring to careers in mathematics and science, waited their turn to sit in the small group gathered around a sofa from which Granville charmed the students, asking as many questions as she answered. Ché Smith, a Spelman 2005 alumna and a past member of the Math Horizons Advisory Board, requested an appointment to interview her the following day to develop an article that could be shared with other students. Later, when questioned about the interview, Smith began, "She was even nicer than I thought she would be." During the interview Smith solicited and received "words of wisdom and life lessons for today's students and for the challenges that we face." The interview continued as Granville and her husband took

[3] "My Life as a Mathematician," *SAGE: A Scholarly Journal on Black Women,* Vol. VI, No. 2 (Fall, 1989), pp. 44–46.

[4] "Discriminating Practices," *Science,* August 10, 1951, p. 161.

"Most people think of math as computation, but really it trains you in logical thinking…and that is something we can all benefit from."
— Evelyn Boyd Granville

Smith and her mother to lunch, where Smith commented, "She interviewed me as much as I interviewed her." Smith is currently a graduate student in biostatistics at the University of North Carolina, Chapel Hill.

On Sunday, May 14, 2006, more friends and admirers were able to hear from Granville at the President's Brunch for honorees that preceded the Commencement ceremony. After a spirited introduction by Dr. Colm Mulcahy, Mathematics Department chairperson, Granville spoke with passion about her early life and subsequent experiences and her concerns about the education of today's youth. She included memories of growing up in Washington, DC with the mother of another honorary degree recipient of the day, Atlanta Mayor Shirley Clarke Franklin. [An interesting account of Granville's early life and education is detailed in "My Life as a Mathematician." See the third footnote.]

During this Spelman visit, Granville was able to see a likeness of her student, the late Etta Zuber Falconer, which was recently assembled as a domino art portrait by the Spelman Mathematics Club under the direction of Dr. Monica Stephens (Spelman C'91) using 37 sets of double nine dominos. The number 37 was chosen because Dr. Falconer retired as Calloway Professor of Mathematics after 37 years on the Spelman faculty.

While in Atlanta Granville was interviewed by a local radio station where she spoke about receiving an honorary doctorate and about the study of mathematics. When asked "why is mathematics important," she responded that "most people think of math as computation, but really it trains you in logical thinking … and that is something we can all benefit from." She went on to say that "mathematics is an essential tool [for life]."

Granville recently visited the College when she was invited to give the Keynote Address for the first Infinite Possibilities Conference (IPC), held on the campus in April 2005. Organized by a group of Spelman mathematics alumnae, the goal of IPC was to "celebrate and promote diversity in the mathematical sciences." Granville inspired many young women mathematicians with her talk entitled "African-American Women in Mathematics: A Rich and Proud Legacy."

During the May 2006 Commencement, there were 27 bachelor's degrees in mathematics among the more than 400 bachelor's degrees awarded. The award to Granville marks the second honorary doctorate awarded to a mathematician by the college in the past decade, the first being awarded to Lee Lorch, Professor Emeritus/Senior Scholar, York University, Toronto in 1999. Smith College awarded Granville an honorary doctorate in 1989, making her the first African-American woman mathematician to receive such an honor from an American institution.

Granville and Spelman Alumnae
From left to right: Emille Davie (C'01), Evelyn Boyd Granville, Jamila Mathias (C'04), Ché Smith (C'05)

About Spelman College

Spelman College is a fully accredited, historically Black, private liberal arts college for women located in Atlanta, Georgia. The College enrolls just over 2,000 students and is classified by the Carnegie Foundation for the Advancement of Teaching and Learning as a highly selective, highly competitive Baccalaureate I institution. On average, 34% of the College's student body pursues majors in the natural sciences, engineering and mathematics.

Photo credit: Angela Beauford (Spelman C'92)

A New *Women in Mathematics* Poster Series

Katherine Socha, Sheila Tobias, and Robin Ward

I. The teacher said what?

A student came home from school and told her parents that her math teacher refused her request to choose a woman as the subject of a class assignment in which students were to write a biography of a mathematician. The reason given by the teacher: "There are no women mathematicians."

Here's a multiple choice test: This conversation took place (a) in 1925, (b) in 1955, (c) in 1985, (d) in 2005. Well, we can't attest to the first three choices, but we can verify that item (d) is indeed at least one correct choice. Last fall, in Arizona, one of us (ST) was contacted by a parent with exactly this concern. This prompted a search for the old "Women of Mathematics" poster that was created about 30 years ago in response to the 1957 "Men of Mathematics" poster sponsored by IBM.

II. What's the big idea?

After an unsuccessful search, we decided to create our own poster to rekindle awareness of the contributions women have made to pure and applied mathematics and mathematics education and to illustrate how mathematics today opens the door to a wider variety of careers than in the past. After much discussion, two of us (ST and RW) had an idea that connects this modern, hyperlinked era with the history of the women's movement: let's establish a model poster and foment a grassroots campaign to create many versions of this template. That is, one version of the poster might feature the subjects of winning entries in the AWM Essay Contest; another might feature local or regional women (Arizona women in mathematics, DC area women in mathematics, Canadian women in mathematics); yet another could be sponsored by organizations such as the AMS, MAA, or SIAM featuring women in their membership; and many others could have quite different themes.

The background for each poster may be keyed to the theme (e.g., organizational logos, a typical regional scene, a graphic representing the industry). Further, the template we crafted also includes a signature element; namely, an empty frame in an eye-catching location on the poster marked "Your picture belongs here."

We would like to see posters that represent all of the following:

- Current U.S. or Canadian women in mathematics, with preference for younger women, including short biographies.
- Women professionals who use their mathematics in interesting, even unusual, ways in addition to pure and applied mathematicians.
- Mathematics educators: teachers and trainers of teachers, as well as mathematics education researchers.
- Ethnic and racial diversity, even if this does not correspond to the proportionality of these groups in mathematics.

We plan to develop a website where the entire collection of photographs, brief and extended biographies, and histories will be housed. Our website will also serve as a central organizer and clearinghouse for the many poster versions. The URL for this website will be included on each poster.

III. How will it work?

Local groups will be responsible for developing their own material by inviting local women to be featured and by writing the brief biographies. Then the material (photos, text, and any images for the background) will be uploaded to our website. We will incorporate the material into the poster template and return an electronic version of the poster at no charge to the submitters. The group may choose to print posters in high quality form at a local print shop and, for instance, auction them off to raise money for a math club or (our goal) hang copies in local schools. If the group gives us permission, we can also make their version available on our website to anyone.

IV. What can I do?

Find a collaborator who also is passionate about improving the climate for girls in mathematics and science. Seek out local women through connections and conversations with industry, schools, alumni associations and ask for their involvement. You need access to a digital camera to take their photographs and a little time from the subjects to compose a brief biography that will inspire young girls. Rather than listing all awards and degrees, you might stress a particular woman's involvement in something of wider interest to the public (the space program, planning the Olympics, searching out Internet fraud, or more). Join us! This project will grow in momentum and value as more people participate.

We welcome comments, ideas, and collaborators. Please contact us at mathposter@awm-math.org or visit our web site www.womeninmath.org.

We decided to create our own poster to rekindle awareness of the contributions women have made to pure and applied mathematics and mathematics education and to illustrate how mathematics today opens the door to a wider variety of careers than in the past.

About the authors/planners:

Katherine Socha is an assistant professor of mathematics at St. Mary's College of Maryland. Her professional interests are in applied mathematics and outreach at the middle school, high school, and early college years.

Sheila Tobias is the author of *Overcoming Math Anxiety* (1978, 1994) and *Succeed with Math* (1987). She is widely known for her advocacy of equality of opportunity in mathematics and the physical sciences.

Robin Ward is an assistant professor of mathematics education at the University of Arizona. Her background is in mathematics, physics, engineering, and mathematics education. Her primary professional interest is advancing the mathematical preparation of K–8 preservice teachers.

Call for Nominations: The 2007 Kovalevsky Prize Lecture

NOTE: The deadline has been changed for this year.

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; however, in 2007 it will be given at the Applied Dynamical Systems Activity Group (Snowbird) meeting in late May. Sonia Kovalevsky, whose too-brief life spanned the second half of the nineteenth century, did path-breaking work in the then-emerging field of partial differential equations. She struggled against barriers to higher education for women, both in Russia and in Western Europe. In her lifetime, she won the Prix Bordin for her solution of a problem in mechanics, and her name is memorialized in the Cauchy-Kovalevsky theorem, which establishes existence in the analytic category for general nonlinear partial differential equations and develops the fundamental concept of characteristic surfaces.

The mathematicians who have given the lecture to date are: Linda R. Petzold, Joyce R. McLaughlin, Ingrid Daubechies, and 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 **October 15, 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.

Education Column

Pat Kenschaft, Distinguished Visiting Professor of Mathematics, Bloomfield College, NJ

Writing in Mathematics as a Substitute for Testing

Why do we test our students? The quick answer is obvious: to see what they have learned. However, we all know that even with the most conscientious test-making, our test grades don't always reflect accurately what students know. Maybe they were getting over the flu, or the dorm hosted a late party the night before, or their dog died that morning. One of my early students told me that the turtle his parents had been given the day he was born had died a few hours before the test, and he could think of nothing else.

Many students have improved their test grades by taking my advice to sleep instead of studying late the night before. One student who crammed just before each test discovered that her grades leaped upward after she tried taking a brisk walk before each test instead of cramming. One tutor tells me she urges her students to get bubble-blowing kits and blow bubbles before a test. There are many other ways to raise test grades without learning more or cheating, as evidenced by the number of generic "test-prep" programs, even on college campuses.

Another reason for giving tests is to prepare your students to succeed in their next course. We know that their next professor will be giving them tests, so if we want a good reputation among our colleagues, we need to provide practice for our students in performing under test pressure. We want the graduates of our Calculus 1 course to excel in Calculus 2, and testing plays a role in this.

A third reason for tests is to encourage students to study regularly. How much is this the real reason? Doing homework regularly is a custom that has almost disappeared in our present culture. Yes, there are still students who show up in class with a question on the homework, but most smile blandly at the question, "Are there any questions on the homework?" Instead, students "study" intensely before each quiz, test, or exam—or at least, they intend to, barring dorm parties, sudden commands to work late, or personal emergencies.

In sequential courses, my reaction to this has been to give frequent quizzes, announced ahead so students will study for them. Most students like this. Each quiz has low stakes, they always have an idea of their grade, and it gives an incentive to study regularly. A few hate it, because they want to study only occasionally and full-time on one subject. I find little correlation between academic excellence and attitude toward frequent quizzes.

In terminal courses for non-majors I find myself deeply contemplating the question of the purpose of testing. The students come to me frightened, abominably prepared, and just wanting to pass their last math course and never think of math again. Why annoy them with tests? I know their performance will not be up to what I think should be college level. (See below for examples.) Since they will never take another math course after they leave me, I don't have to protect my reputation through them. Is testing really the best way to get them to study?

Fortunately, just before the first time I taught such a course, I happened to visit my sister-in-law who is an English professor. She suggested I evaluate their work via weekly essays on what they do know, instead of probing what they don't. In some courses the generic question is, "What did you learn this week?" and in another it is "Respond intellectually to what you read this week." This has worked well.

How does one grade such papers? We're math professors, not writing teachers. Just check them off, and give three points for each paper that is adequate and about 250 words. I give an extra point for an exceptionally good paper and dock a point for those that are appalling and/or too short.

At first I didn't mark up the writing at all, but within a few weeks of the first try at this, the students begged me to correct their writing. I don't have to be very conscientious at this—I'm a mathematics professor!—but I do make grammatical and stylistic suggestions of the "most needy" type for each paper. The students' writing improves remarkably in a semester of this. I enjoy reading such papers far more than marking tests and quizzes. I write comments in response to their writing, which develops a relationship with each student, but I don't feel obligated to do this on every paper.

I also ask them to hand in a question about the reading on an earlier day of the week than when the paper is due. The questions provide a basis for animated classroom

discussion, and composing them prods the students to read more. Students have said to me that instead of skipping the reading as they usually do, they read each assignment twice, once for the question and once when they write their 250-word essay about what they have learned.

I also require a five-page research paper. This is graded more conventionally. When I received the first batch, I took it to the director of our public schools' high school "Writing Room" for guidance in grading. She complimented me on the quality of the writing. "You can see they have practiced, and that they are writing to be read."

A three-page summary at the end of the semester rounds out the assignments. Instead of a final exam, we put the chairs in a circle (as we often have for discussions during the semester) and all students report on their three-page papers. I insist on some mathematical presentation from each, which serves as a review for the entire class. The students generally prepare, and the final session is usually quite satisfying.

I want to point out there are alternatives to testing some of the time. My non-major students claim to really learn while writing those essays and in the class discussions stimulated by their questions.

But where are the standards? What do they know? I have openly given up on maintaining "standards" in these classes, an option available to a full professor with tenure. I believe this is appropriate given the situation in which they come to me. I tell them I want them to learn some mathematics. They also need to learn that they can learn mathematics, and that mathematics can be pleasant and useful. That is my goal for non-major, terminal courses.

In what situation do they come to me? For this I can only give examples. Some are well prepared, but the following stories are from Montclair State University, one of the most competitive institutions in our technological state. Repeatedly, I am asked why when you intend to divide a product by a number, you divide only one factor by the number, not two or more. They clearly don't understand multiplication as well as I can easily teach it to third graders. Their understanding of fractions is worse. A colleague was asked by five students, who made a joint appointment for the purpose, how to use a ruler; they did not have the concept of length.

A prospective nurse correctly changed from kilograms to pounds to establish that the average American eats 97 pounds of beef a year. But to compute the amount of fossil fuel the average American consumes via beef given that each pound of beef consumes 40 pounds of fossil fuel, she *divided* the 40 into 97. A future elementary school teacher insisted on the last day of her formal math education that if the average fuel mileage of family-owned small trucks in 1999 was 20 mpg and the average fuel mileage of family sedans was 28 mpg, then altogether family vehicles must have a fuel mileage of 48 mpg. "Altogether" means "add."

At Bloomfield College the admissions standards are lower. Only two of my students in this spring's class could figure out 25 percent of 40 without a calculator.

These are students who have passed the New Jersey standardized high school graduation tests. They tell me eloquently that their reaction to taking tests is that they may (should?) forget everything they have learned after taking the test. I hear this so consistently that I suspect it is true. There are many other disadvantages with our country's preoccupation with tests that will serve as a basis for another column. But for now, I want to point out there are alternatives to testing some of the time. My non-major students claim to really learn while writing those essays and in the class discussions stimulated by their questions.

Our national government is beginning to discuss implementing standardized tests at the collegiate level to maintain "standards" across institutions of high education. We need to converse more about the purpose of (mathematics) education, the extent to which its goals can be measured, and the impact of standardized tests, especially of the No Child Left Behind Act, on our current incoming students. Unless we act soon, some day our professional judgment in higher education may face interference similar to that our K–12 colleagues already experience. Meanwhile, I want to emphasize that there are alternative ways to teach and grade non-majors' courses, and that "One Size Fits Few," as Susan Ohanian's book title puts it so succinctly.[1]

[1] Susan Ohanian, *One Size Fits Few,* Heinemann, Portsmouth, NH, 1999.

PTP Women in Mathematics Delegation Visits China

M. Leigh Lunsford, Longwood University and Lisa E. Marano, West Chester University of Pennsylvania

Imagine our surprise in April 2005 when each of us opened a letter from Sylvia Wiegand, former president of AWM, inviting us to travel with her to the People's Republic of China as members of the Women in Mathematics Delegation of the People to People (PTP) Ambassador Programs [1]. This once-in-a-lifetime opportunity would allow us to visit China while simultaneously connecting with fellow mathematicians and mathematics educators! The December trip would take us to Beijing, Nanjing, and Shanghai where we would not only take in cultural sites, such as the Forbidden City and Great Wall, but also engage in meetings with our professional counterparts. What follows are some of our observations and discoveries during the trip.

Delegates and their guests at the Quanjude Roast Duck Restaurant in Beijing

Our delegates came from a broad spectrum of the mathematics community including high school teachers, college and university professors, industrial mathematicians, and an undergraduate. While in China we had professional meetings at the Beijing Mathematics Association, the Experimental Primary School for Beijing Normal University, Beijing University (with the Capital Woman Professors Association), the Nanjing University of Aeronautics and Astronautics (NUAA), Nanjing Normal University, the Mathematics & Science College of Shanghai Normal University, and the Shanghai Yan'an Middle School. Typically, the format of our professional meetings would begin with greetings and opening remarks from our hosts, followed by opening remarks from our delegation leader, Sylvia Wiegand; introductions would be followed by a group discussion in which our delegation and our Chinese hosts would take turns asking and answering questions. The topic of discussion generally focused on the differences and similarities in mathematics education, at all levels, in the US and China with a common thread throughout the discussion being issues facing women in our respective mathematics communities. Our Chinese hosts were lively, curious, and informative, and oftentimes our sessions would end (too quickly) with an exchange of gifts, a group photo and tears.

Although we were the Women in Mathematics Delegation, six of the fifteen delegates were men. This surprised one of our Chinese counterparts from the Beijing Women's Federation. It was during this meeting that we had our most frank discussion regarding the difficulties facing women in mathematics in both countries. From this discussion and the others, we were able to note some of the concerns facing the women in mathematics in China. First, the number of women studying graduate mathematics varied greatly from university to university. For instance, at Beijing (aka Peking) University, one of the top research universities in China, approximately one in eight mathematics graduate students were females, whereas at NUAA, about 70 percent were female. As in the US, our Chinese colleagues noted that the percentage of women studying engineering is much lower. We also heard anecdotal concerns similar to those facing women in academia in the US. Our Chinese counterparts felt the effects of the "two-body" problem; they noted that universities rarely hire couples in the same field. Several female graduate students and junior faculty felt

they were at a disadvantage because China has no state-run child-care and most child-rearing duties are put on the mother. Some of our Chinese colleagues said that it was not uncommon for parents to move in with them so that they could take care of the children. Also, one junior faculty member felt that women may miss valuable research opportunities abroad because obtaining travel visas for the entire family is difficult and leaving a family behind is not as acceptable for a woman as it is for a man. This led us to one sure conclusion: women in academia, especially in mathematics, grapple with the same issues, wherever they are.

One of the big surprises for many of us in the delegation was that the Chinese Ministry of Education recently (2001) released the New Mathematics Curriculum Standard, based largely on the NCTM standards issued here in the US in 1989. This topic came up often in our meetings with our Chinese counterparts and was obviously a controversial one. This was certainly apparent at our meeting with members of the Chinese Mathematics Society (CMS). It seems the "math wars" have come to China. The new standards in China were well-intentioned and meant to address problems in their system: "students' lack of creativity, an over-emphasis on testing, a focus on memorization over application, a disconnection between school learning and real-life situations, and overworked students" [2]. China has nine years of compulsory education, after which students must pass a national exam to continue on to high school. Some members of the CMS thought that due to the pressure of the national exams, the Chinese students spend too much time practicing and not enough time understanding. However, they were also very concerned about the lack of rigor in the implementation of the new standards. Some of the members thought that the new mathematics standards focused more on curriculum design than on content. One of the differences we discussed with the CMS members about our respective teaching systems was that in the US, students cover much material, but they don't go into any real depth. In China, the students cover less material, but at a much deeper level. We all agreed that the ideal would be some where in between.

Interestingly, the teaching of mathematics in China is quite different at the elementary level than in the US. Many of our hosts were familiar with the book by Ma Liping, *Knowing and Teaching Elementary Mathematics,* which is an excellent study about teachers' understanding of fundamental mathematics in China and the US [3]. In our discussion with our Chinese counterparts, we learned of the teaching practices described by Liping. Generally, Chinese elementary school mathematics teachers do not teach the entire curriculum but instead have specialized training in mathematics and continue to learn mathematics throughout their teaching careers via a system that encourages mentoring as well as time for deliberation and contemplation with

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.

fellow teachers about mathematics, lessons, etc. The mathematics teachers at the Experimental Primary School we visited each had at least three years of university level mathematics, plus a year as a student teacher and then three years teaching under a mentor. To teach high school level mathematics in China, especially in the cities, a teacher must have a master's degree in mathematics. However, in rural China it is harder to obtain teachers with specialized qualifications.

Delegates and counterparts at Shanghai Normal

For many of the delegates the visit to the Yan'an Middle School (equivalent to grades 10 through 12 in the US) was one of the highlights of the trip. The delegation observed a mathematics class in which the teacher introduced combinations and permutations. The teacher asked, "How many ways could two of the students in the class be chosen to speak and translate with the delegates?" The teaching methods employed were excellent, using group work and individual response as well as posing the lesson in the context of our visit. It was a delight to watch the teacher interact with the students, the students interact with each other, and for us to talk with both the students and teachers. This led us to yet another sure conclusion of our trip: teenagers are teenagers no matter where they live.

Overall, our discussions with our Chinese counterparts about mathematics education led us to our final conclusion: mathematicians are mathematicians no matter where they live and thus have many of the same concerns about the teaching of their beloved subject.

In addition to our professional activities, we were also able to engage in cultural activities such as visiting museums and historical sites. Many of the delegates found China to be a country in transition where old and new and rich and poor were side by side. The amount of construction in the cities was incredible as well as the amount of traffic. Of course the food was wonderful and sometimes quite unusual, especially the fried scorpions we sampled at the Quanjude Roast Duck Restaurant in Beijing. Certainly we can now fully appreciate the wonder of the Great Wall of China. Other highlights were bartering in the shops and seeing the countryside on the train ride from Nanjing to Shanghai. Most importantly, it was great to get to know our fellow delegates and our Chinese counterparts. To see many pictures from our trip, please visit our website [4].

Finally, for those interested in learning more about how mathematics is taught, practiced and perceived in China and other emerging nations, please attend our panel discussion at the Joint Mathematics Meetings in New Orleans on Friday, January 5, 2007 [5]. The panel will also discuss other professional travel opportunities such as the MAA Study Abroad Tours.

The authors would like to thank their Chinese counterparts for hosting our delegation and for their willingness to discuss issues in mathematics and their fellow delegates and the People to People Ambassador Program for compiling a *Journal of Professional Proceedings* from which many of the above observations were taken.

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3. Ma, Liping, *Knowing and Teaching Elementary Mathematics: Teachers' Understanding of Fundamental Mathematics in China and the United States,* Lawrence Erlbaum Associates, Inc., 1999.
4. http://www.flickr.com/groups/women-in-math-china-2005/
5. Panel Discussion: "Mathematics and Mathematicians in Emerging Nations," Friday, January 5, 2007, 3:50 – 5:40 P.M. at the Joint Mathematics Meetings, New Orleans, LA.

Book Review

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

Differences or Similarities in Mathematics? Finding an Integrating Focus

Reviewers: Marcia C. Linn and Cathy Kessel.

Gender Differences in Mathematics, Ann M. Gallagher & James C. Kaufman (Eds.). New York: Cambridge University Press, 2004. 368 pp, ISBN 0-52182-605-5 $70.00 trade cloth, ISBN 0-52153-344-9 $27.00 paper.

Gender Differences in Mathematics, edited by Ann M. Gallagher and James C. Kaufman, strengthens the emergent finding that gender differences in mathematics have diminished and are approaching zero. Males and females perform similarly on most mathematics tests. Males and females enroll in pre-college courses in almost equal numbers. Males and females major in mathematics in college in almost equal numbers. Females perform somewhat better than males in most mathematics courses and males outperform females on college admissions tests. The findings in this book resonate with recent papers by Janet Hyde (2005) advocating the gender similarities hypothesis and by Elizabeth Spelke (2005) arguing for lack of differences in intrinsic aptitude for mathematics and science.

We strongly recommend this book for everybody involved in interpreting gender-related investigations: for researchers interested in studying individual differences in performance in mathematics, for policy makers who make gender-relevant decisions, and for educators who interact with students learning mathematics. This book brings together viewpoints and studies from a broad array of researchers, enabling readers to compare arguments and evidence—and to identify emergent trends.

This book illustrates why findings about gender differences in mathematics are so often contested. It focuses attention on both the beliefs that are held in the field about participation and achievement in mathematics and the reasons why women are underrepresented in some careers that require mathematics, including engineering and physics. The fifteen chapters are written by an impressive array of effective and influential researchers. We encourage readers to take advantage of the carefully reasoned arguments in each chapter to formulate their own perspectives on gender and mathematics.

To test your beliefs about male and female performance and participation in mathematics, predict answers for the following questions. You may wish to record both your own predictions and those you would expect from groups such as teenagers, engineering professors, and high school mathematics teachers. Statistics relevant to these questions are discussed in the conclusion of this review.

In the United States:

- What is the average score difference (in standard deviation units) for high school men and women on mathematics achievement tests, high school and college grades, and college admissions tests?
- What percentage of bachelor's degrees in mathematics is awarded to women?
- What percentage of Ph.D.'s in mathematics is awarded to women?
- What percentage of engineers is female?
- What percentage of tenured positions in the "top ten" mathematics departments is held by women?

Perspectives on Gender and Mathematics

The first two chapters explain that researchers typically investigate questions they believe are central to the field. They argue that researchers, appropriately, make predictions concerning outcomes, and they point out that when conflicting findings exist, predictions influence both the conduct of research and the interpretation of results. Because of the cacophony of results that concern mathematics and gender, it is possible to choose collections of individual findings that support a variety of viewpoints. Those conflicting viewpoints are represented in this book, which advances the field by allowing readers the opportunity to identify a synthesis among them.

Susan Chipman, in the first chapter, sets the stage by providing a case history of research on mathematics and gender. Chipman reports that Lucy Sells' analysis of the entering class at the University of California, Berkeley in 1972 revealed that only 8% of the women, compared to 57% of the men,

had taken four years of high school mathematics. This finding, although unpublished, received a lot of attention and spurred the eventual announcement of the National Institute of Education grants program in 1977. Chipman describes the kind of research that was funded, the sorts of findings that emerged, and her edited volume (Chipman, Brush & Wilson, 1985) summarizing the results. A surprising finding was that by the 1998 high school transcript study, the participation of men and women in high school mathematics courses was essentially the same. Of the factors studied in Chipman's research program, one stood out. Consistently, women expressed greater anxiety about mathematics than men, in spite of reporting an equal liking for mathematics. At the same time, all the research funded by the NIE program pointed to what Hyde calls the gender similarities hypothesis. Men and women perform equally on most indicators of mathematics achievement, participate in mathematics majors with equal frequency, and are converging on similar beliefs about the utility of mathematics. Differences remain large and consistent in the participation of women compared to men in engineering and physics majors and careers. In addition, a smaller percentage of women than men pursue advanced degrees in mathematics, although that percentage has increased steadily. Chipman concludes that, despite extensive research showing gender similarities, "many people do not want to believe that girls and women can be good at mathematics" (p. 18). Chipman initiates the process that is a theme of the book: showing how beliefs influence both the conduct and interpretation of research on mathematics and gender.

In the second chapter, Jeremy Caplan and Paula Caplan illustrate the challenges of sorting out findings by demonstrating the important and influential impact of researchers' beliefs on the conduct and interpretation of investigations of mathematics and gender. Caplan and Caplan point out that the work of Benbow and Stanley, which emphasizes gender differences, has received a disproportionate amount of media coverage compared to results showing similarities between male and female performance. Its effect endures in the current book. Most of the chapters mention the 1980s work of Benbow and Stanley. Their findings resulted from a talent search among children under 14 in which boys were more successful than girls on the SAT and for scores over 700, the ratio was 13 boys to 1 girl. These results were widely publicized, but have not held up over time. In a 1997 letter to the editor of the *Johns Hopkins Magazine*, Stanley wrote that the ratio had diminished to about 4 to 1, and in 2005 in an interview with *The Chronicle of Higher Education*, Stanley reported that the ratio had fallen further to 2.8 to 1 (Monastersky, March 4, 2005). Similar findings have been reported for the Duke talent search (Goldstein & Stocking, 1994) and the Johns Hopkins talent search (Brody, Barnett, & Mills, 1994). These important trends do not gain any mention in *Gender Differences in Mathematics*, an unfortunate result of their being published in relatively unpublicized conference proceedings.

Having had our consciousness raised by the Caplan and Caplan chapter, we found evidence for statements that predict a particular outcome to be extensive in this book. For example, as Caplan and Caplan point out, even the title of the book, *Gender Differences in Mathematics*, implies that these differences exist. They also note however that the move from "sex differences" to "gender differences" is significant because in the field, gender has a cultural connotation whereas sex has a biological connotation. Thus, adjusting the differences, when they do exist, might have a more cultural than biological explanation.

We encourage readers as they analyze the various chapters in the book to pay attention to how questions and results are framed, which results are emphasized, and which are mentioned in passing. Interpreting findings in mathematics and gender can benefit from awareness of the researchers' biases. The gender similarities hypothesis is also extremely useful in making sense of contradictory results reported in this volume. Our own beliefs tend towards the gender similarities hypothesis put forth by Hyde (2005) and could of course also color our interpretation of the work.

Interpreting Research: Three Examples

We offer three examples to illustrate how strongly held and disparate accounts of gender differences in mathematics play out in interpreting research findings.

First, how do researchers characterize mathematical proficiency? Are proficient mathematicians able to solve problems in less than 60 seconds? This skill helps on speeded tests, but may not surface in mathematics careers. For example, Andrew Wiles spent over seven years on the proof

of Fermat's Last Theorem (Singh, 1997). Do proficient mathematicians have unique visualization skills? Nuttall, Casey, and Pezaris (chapter 6) say, "Math activities requiring the transformation or manipulation of mental images are rarely required for successful math performance" (p. 136). They argue that mental visualization is required for activities such as carpentry, electrical circuits, sketching house plans, constructing go carts and model airplanes, and glass blowing. Other chapters (Halpern et al., chapter 3) argue that "when solving calculus and advanced geometry problems, a visual-spatial strategy is more likely to yield mathematical insight than a verbal rule-based strategy" (p. 67). Gallagher and Kaufman (chapter 15) conclude that mathematical reasoning is only vaguely defined in most testing organizations that produce measures of this construct.[1] They comment, "Specifications for the contents of such tests are often based more on historical precedent than on theoretical work defining which cognitive processes are crucial components of mathematical and spatial reasoning and which are not" (p. 317).

As these comments indicate, mathematical proficiency is characterized in multiple ways that could result in disparate patterns of male and female performance. These patterns are illustrated in different chapters of the book. Measures that advantage males are: SAT scores (mentioned in twelve chapters), GRE scores (five chapters), Advanced Placement tests (two chapters), degrees in science (two chapters), and participation in careers that require mathematics such as physical sciences and engineering (three chapters). Measures that show little difference or advantage females are: mathematics achievement tests (mentioned in twelve chapters), mathematics course grades (eleven chapters), mathematics course participation (four chapters), undergraduate degrees in mathematics (one chapter), and participation in careers that require mathematics such as auditing, accounting, and economics (one chapter).

Second, what is the role of spatial abilities in mathematics performance? In 1974, Maccoby and Jacklin identified a gender effect for spatial reasoning. Many researchers drew on this finding to argue for gender differences in success in careers like physics and engineering. Results of subsequent research raise questions about the existence of gender differences in spatial ability. In 1985, Linn and Petersen performed a meta-analysis on all available studies and reported three findings. The strongest of these was one of no difference between males and females on measures like paper folding, embedded figures, and two-dimensional rotation where students are required to reason about spatially presented information. At the same time, Linn and Petersen reported that the meta-analysis revealed large differences between males and females on tasks requiring the rapid mental rotation of three-dimensional objects.[2] Subsequent research reports that these differences have diminished (Hyde, 2005) and are amenable to instruction (Baenninger & Newcombe, 1989).

Yet, similar to the reliance on the work of Benbow and Stanley, many authors cite the large difference in the rate of mental rotation of three-dimensional objects reported in 1985 rather than later work. Nevertheless, the 1985 finding has motivated many researchers to call for an infusion of spatial reasoning instruction into the curriculum, a laudable goal that would advantage large numbers of students who lack exposure to spatial tasks.

The third finding reported by Linn and Petersen in 1985 concerns the performance of respondents over age 25 on the Water Level Test. Some researchers use gender differences on this task to explain gender differences in mathematics, but it is more commonly cited as a factor in map reading (Liben, 1991). As several chapters in the book report (Chipman, chapter 1; Halpern et al., chapter 3), strong relationships between measures of spatial reasoning and measures of mathematical achievement are rare when general ability is controlled. Thus, researchers seeking to explain gender differences in mathematics might wish also to explain gender differences in spatial reasoning rather than to attempt to connect these differences as stemming from the same underlying cause.

Our third example comes from research on stereotyping, confidence, anxiety, and self-efficacy. Two chapters (Davies & Spencer, chapter 8; Ben-Zeev et al., chapter 9) stress that activating stereotypes associated with gender and mathematics can boost or depress test performance. Many authors connect this finding to a decrease or increase in

[1] Some counterexamples are given in Schoenfeld (in press).

[2] For examples of spatial visualization and mental rotation tasks, see p. 26 and p. 99 (respectively) of *Learning to Think Spatially* at http://darwin.nap.edu/books/0309092086/html/.

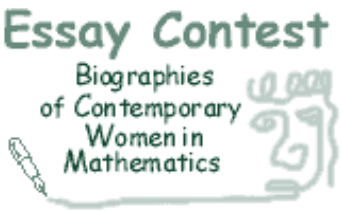
anxiety, which has been well established as a factor in both improving performance at low levels and depressing performance at high levels. Claude Steele (1997) has referred to this as "stereotype threat" and argues that when achievement situations elicit stereotypes, they raise anxiety to unhealthy levels and affect performance. Several authors argue that this difference in anxiety could explain women's tendency to earn better grades relative to their SAT scores because classroom learning is less likely to trigger stereotypes than taking high stakes tests. Ben-Zeev et al. (chapter 9) report results on arousal as a mediator of stereotype threat. They use measurements of cortisol levels and show that these levels may affect performance of both males and females. Although females' anxiety levels are susceptible to stereotype threat because of the perceived underperformance of females relative to males in mathematics, similar findings obtain for performance of African-Americans relative to other ethnic groups and performance of white males relative to Asians. Remedies include a dormitory-based program for undergraduates designed to assure them that they would not be viewed through the lens of negative stereotypes (discussed by Davies and Spencer) and changing individuals' beliefs about intelligence as fixed to intelligence as malleable (discussed by Ben-Zeev et al.).

Interpreting SAT Performance

The meaning of mathematical proficiency, the role of spatial reasoning, and the role of anxiety contribute to the interpretation of gender differences in performance on the SAT. In this section we illustrate how this theme carries through the volume and suggest that readers revisit and reflect on this important dimension. The SAT is important in the United States: there is a large difference between performance of males and females on this test, scores are used in many important selection decisions, and scores receive extensive annual publicity.

These factors play out in the multiple interpretations of gender differences in SAT performance, which seems especially vulnerable to interpretations based on researchers' beliefs. Because differences in SAT performance are the most consistent remaining, as other differences have diminished, they are a litmus test for beliefs about gender and mathematics. Some researchers emphasize difference and see these results as valid. Researchers that focus on similarities see the gender differences in SAT scores as anomalous. Despite this, Catsambis (pp. 222) reports that the gap between men and women on this test is narrowing. This is happening in spite of the fact that more and more women are taking the SAT relative to men, suggesting that the population of female SAT-takers is less highly selective than that of male SAT-takers.

Chipman, for example, suggests that the SAT results might be anomalous in that they could be remedied by selecting different types of items of equal validity. She points out that one important kind of item was dropped by ETS because of its potential for coaching, but it was an item on which women outperformed men. Cohen and Ibarra's (chapter 7) analysis also raises validity issues. Cohen and Ibarra examine differential item functioning (DIF), which "arises



To increase awareness of women's ongoing contributions to the mathematical sciences, the AWM is sponsoring an essay contest for biographies of contemporary women mathematicians and statisticians in academic, industrial, and government careers. Funding will be provided by Sandia National Labs.

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**.

when examinees of the same ability have different probabilities of responding correctly to a given question on a test" (p. 143). Test items are selected for exclusion if they have extreme DIF, but they can be included as long as their gender effect is consistent with the current gender difference found on the test, thus preserving the potential differences.

In spite of widespread beliefs that men are more successful than women in mathematics, men and women participate in mathematics pre-college courses and undergraduate majors at almost the same rate.

Royer and Garofoli (chapter 5) found that relationships between scores on 16 SAT items and measures of spatial cognition and math fact retrieval were not uniform, but that both measures predicted speed and accuracy of performance on particular SAT items. This relationship led Royer and Garofoli to hypothesize that ability to quickly search memory for familiar problem elements contributes to performing well on the SAT (but not on course examinations) and that this ability is related to spatial cognition. Gallagher and Kaufman suggest another explanation: speed in retrieval of facts may not cause better SAT performance, but may instead be a byproduct of "greater interest, experience, and motivation in mathematics—which could also result in superior SAT performance" (p. 321).

Nuttall, Casey, and Pezaris (chapter 6) examined relationships of SAT or TIMSS performance with various measures of spatial ability and attitudes about mathematics, finding in both cases that spatial skills contributed more to performance than attitudes. Nuttall et al. consider possible origins of spatial abilities. Longitudinal studies show that spatial abilities are related to early experiences such as the amount of time spent playing with blocks. Nuttall et al. note that U.S. teaching methods differ from those in some other countries (e.g., Japan) and suggest that appropriate teaching methods, starting in early grades, may provide beneficial spatial experiences to all students.

Like Nuttall et al., Byrnes (chapter 4) includes teaching methods and curriculum in his hypotheses about causes for gender differences in SAT performance. He and his colleagues found that the SAT items that produced the largest gender differences for U.S. students produced none for Japanese and Chinese high school students. Consistent with the emphasis on gender differences, this finding of "no difference" has not received wide publicity.

Interpretations of strategies used by men and women in SAT-taking provides further evidence of the importance of beliefs on interpretation of scientific results. Individuals who want to use the gender difference in the SAT as evidence for an underlying ability of men to do better than women argue that women use more conventional strategies for solving SAT items, while men use more unconventional and often more efficient strategies. The difference in efficiency would of course be an important factor in performance on the SAT. Others looking at the same results, but including findings from Steele on stereotype threat, argue that under conditions of high anxiety, women might resort to more conventional strategies, consistent with extensive research on individual performance during anxiety-producing situations. They argue that the gender difference in performance on the SAT is reflected in a lack of risk-taking on the part of women because of their heightened anxiety during the test.

Gallagher and Kaufman review this evidence in their concluding remarks and question the validity of the SAT for measuring aptitude for college. The SAT underpredicts college grades for women relative to men and could be viewed as a test that actually discriminates against women, or at least offers an invalid picture of the performance of women relative to men. The developers of the test argue that student scores should not be used in isolation. However, Gallagher and Kaufman question this recommendation and advocate using measures that do not need other measures in order to become valid. They also point out that people often use scores in isolation, increasing the danger that it might result in biased selection decisions (pp. 329–330).

Conclusions

The chapters in this book raise important issues about the effect of beliefs held by researchers, citizens, parents, and the students themselves on the success of males and females in mathematics and careers that draw on mathematics. In spite of widespread beliefs that men are more successful than women in mathematics, men and women participate in mathematics pre-college courses and under-

graduate majors at almost the same rate. Measured in standard deviation units, datasets for women and men who attended high school between 1972 and 1992 show small differences in high school mathematics achievement scores. For grade 12 these differences favored men and diminished from 1972 to 1991 (Xie & Shauman, 2005, p. 37). In 1992, these differences favored women in grades 7 through 11 (and are not given for grade 12). High school mathematics course participation was similar for both genders and women reported slightly higher grades (Xie & Shauman, 2005, p. 241). Consistent with these results, Hyde (2005) reports that differences are small on measures of mathematics computation, concepts, and problem solving. For undergraduate mathematics course grades, differences are small and favor women (Linn & Kessel, 1996, p. 105). In contrast, Ben-Zeev et al. note that the SAT and the quantitative portion of the GRE reveal a gender difference favoring men on the order of half a standard deviation.

Large differences occur in some science and engineering careers. In general, only 10% of current engineers are female and only about 21% of college graduates in engineering are female (National Science Board, 2004). In contrast, Chipman (p. 3) characterizes mathematics as "the least sex-typed of college majors" and reports that females received 47% of bachelor's degrees and 25% of Ph.D.'s in 2000. In mathematics departments, tenure-eligible college faculty members are 31% female, other full-time faculty members are 47% female, and tenured faculty members are 17% female (Lutzer, Maxwell, & Rodi, 2002). In the "top 10" mathematics departments, there are approximately 300 tenured faculty members; 16 of them are female (Jackson, 2004).

As chapters of the book document, choosing a career is a multi-faceted activity, depending not just on aptitude, but on interest and on workplace environment. These may jointly contribute to the number of men and women who participate in engineering—and computer science, physics, astronomy, and related fields. In an advertisement in support of affirmative action in the state of Washington, IBM argued that having male and female members of their product development teams had advantaged the company. Thus, there are reasons for seeking to modify beliefs and expectations about the participation and performance of men and women in mathematics. *Gender Differences in Mathematics* goes a long way towards encouraging examination of these important issues and motivating us all to reflect on how our beliefs, important as they are, may cloud our judgment and thinking when conducting research, interpreting findings, and counseling individuals, as well as in making decisions about our own lives.

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.

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NSF-AWM Mentoring Travel Grants for Women

The objective of the NSF-AWM Mentoring Travel Grants is to help junior women to develop a long-term working and mentoring relationship with a senior mathematician. This relationship should help the junior mathematician to establish her research program and eventually receive tenure. AWM expects to award up to seven grants, in amounts up to $5000 each. Each grant will fund travel, accommodations, and other required expenses for an untenured woman mathematician to travel to an institute or a department to do research with a specified individual for one month. Awardees may request to use any unexpended funds for further travel to work with the same individual during the following year. In such cases, a formal request must be submitted by the following February 1 to the selection committee, or the funds will be released for reallocation. (Applicants for mentoring travel grants may in exceptional cases receive two such grants throughout their careers, possibly in successive years; the second such grant would require a new proposal and would go through the usual competition.) For foreign travel, US air carriers must be used (exceptions only per federal grant regulations; prior AWM approval required).

Eligibility. Applicants must be women holding a doctorate or equivalent experience and with a work address in the US (or home address if unemployed). The applicant's research may be in any field that is supported by the Division of Mathematical Sciences of the National Science Foundation. (See http://www.nsf.gov/od/lpa/news/publicat/nsf03009/mps/dms.htm#1 for the list of supported areas.)

Applications. Each applicant should submit ***five copies*** of each of the following: 1) the AWM Mentoring Travel Grant Form; 2) a cover letter (if a prior AWM-NSF mentor grant has been awarded, indicate so); 3) a curriculum vita; 4) a research proposal, approximately five pages in length, which specifies why the proposed travel would be particularly beneficial; 5) a supporting letter from the proposed mentor (who must indicate his/her availability at the proposed travel time), together with the curriculum vita of the proposed mentor; 6) a proposed budget; and 7) information about other sources of funding available to the applicant. A final report will be required from each awardee. All awards will be determined on a competitive basis by a selection panel consisting of distinguished mathematicians appointed by the AWM. Send all application materials to: Mentoring Travel Grant Selection Committee, AWM, 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 via e-mail or fax will not be accepted. The deadline for receipt of applications is **February 1, 2007**.

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The Trouble with SPMY

Cathy Kessel

At the First National Summit on the Advancement of Girls in Math and Science, Secretary of Education Margaret Spellings announced that Camilla Benbow had been appointed as vice-chair of the National Mathematics Advisory Panel. The choice of event is particularly ironic because in the 1980s, the work of Benbow and her co-author Julian Stanley generated headlines such as "Do males have a math gene?" and "Are girls born with less [math] ability?" At the time, this work was heavily criticized—by Mary Gray and Alice Schafer (first and second presidents of AWM), among others. But, what of Benbow's later work on the Study of Mathematically Precocious Youth (SMPY)? Does it qualify its author to be on an advisory panel for mathematics education—or on the National Science Board to which she has been nominated? Because this work has been published in well-respected psychology journals, this essay is not only a critique of the work in question, but also suggests concerns about the system that makes this work respected.

In 1980, Camilla Benbow and Julian Stanley published an article in *Science* entitled "Sex Differences in Mathematical Ability: Fact or Artifact?" They reported large gender differences in "mathematical reasoning ability." Their evidence was scores on the mathematics SAT taken by seventh and eighth graders as part of a talent search for a program at Johns Hopkins University. In a sample of about 10,000, collected between 1972 and 1979, the distribution of boys' scores differed greatly from the distribution of girls' scores. For example, 1,817 boys and 675 girls scored above 500. In their conclusion, Benbow and Stanley explicitly favored (their word) "the hypothesis that sex differences in achievement in and attitude towards mathematics result from superior male mathematical ability … [which] is probably an expression of a combination of both endogenous and exogenous variables." The result of the article was, as Benbow and her colleagues noted twenty years later, a "media field day."

Concerns about Methodology. To us now, it may seem strange that anyone would put so much weight on these findings. Indeed, it did to some then. Mathematics education researcher Elizabeth Fennema said, "I think they [the Johns Hopkins group] are on darned shaky ground when they draw conclusions about genetic differences."[i] Letters to the editor of *Science* took issue with various aspects of the study. Susan Chipman, then at the National Institute of Education, wrote, "The most serious problem with the report by Benbow and Stanley is the underlying presumption that the concept of mathematical ability as defined by the SAT, is theoretically defensible."[ii] In a *Science* editorial, Alice Schafer and Mary Gray wrote, "There are at least two problems with [Benbow and Stanley's] hypothesis. First, environmental and cultural factors have not been ruled out. . . . Second, it is not clear SAT mathematics scores are a good measure of inherent mathematical ability."[iii1]

In 1983, Benbow and Stanley published another article in *Science* entitled "Sex Differences in Mathematical Reasoning Ability: More Facts." They reported that in talent searches in 1980, 1981, and 1982, about 13 boys to every 1 girl scored above 700. The numbers were very small (see table below).

Concerns about Accuracy. Thus far, the story is summarized by Schafer and Gray's two points: Social and environmental explanations have not been ruled out, and the SAT is an unlikely measure of mathematical aptitude. These concerns remain. Work published after 1983 gives rise to others.

In 1988, Benbow published an article in *Behavioral and Brain Sciences* concluding, "it is clear after the testing of several hundred thousand intellectually talented 12- to 13-year-old students nationwide over a 15-year period that there are *consistent* [emphasis added] sex differences favoring males in mathematical reasoning ability (or more specifically in SAT-M scores). These differences are pronounced at the highest levels of that ability." But, this could not have been the case. According to a 1984 article, nationwide searches did not begin until 1980.[iv]

There is no statement in the B*ehavioral and Brain Sciences* article of how many students scored above 700 after 1983 in the nationwide search, nor how many students had been tested. The number of students with scores above 700 was not stated for Hopkins talent searches between 1972 and 1979. The 1984 article did not compute male–female score ratios for scores above 600 or 700 between 1972 and 1979. In this article, all differences given were deemed significant by a two-sided t-test, so presumably the ratios not given were too small to test for significance.

[1] Unquestioning use of standardized tests to define attributes such as "mathematical ability" or "mathematical reasoning" continues to be a problem. See the review of *Gender Differences in Mathematics*, pp. 20–27.

The table below shows statistics for the Hopkins talent searches and the nationwide search given in articles about SMPY, together with later statistics for the Hopkins search given by Hopkins Center researchers and Julian Stanley. Statistics for the Duke talent search are included for purposes of comparison. The later Hopkins statistics and the Duke statistics suggest that "consistent sex differences" was not an accurate characterization, even in 1988.

Some articles on SMPY written after 1983 mention the 13 to 1 ratio, but not later talent search ratios. For example, Lubinski and Benbow's 1992 article "Gender Differences in Abilities and Preferences Among the Gifted: Implications for the Math-Science Pipeline" says:

> In mathematically gifted samples, disparate male/female proportions are well-known.... We illustrate this point using data collected over the 20-year period from 1972 through 1991, on well over 1 million seventh (and some eighth) graders who were tested in various talent searches across this country. (p. 62)

The article states that in these talent searches (which included Hopkins and Duke), the resulting proportion of males to females for SAT-M ≥ 700 was 13 to 1. This statement has two footnotes. The first cites the 1988 *Behavioral and Brain Sciences* article, which does not mention data collected after 1988 and does not mention the Duke search. No other sources for assertions about talent search ratios are given, although the article includes a detailed analysis of SAT scores for the Iowa talent search. Gender ratios for the Iowa search are not reported.

The second footnote appears to contradict the assertion that the ratio was 13 to 1. It says,

> In American samples, these ratios have been fluctuating over the past decade at least partly as a function of increasing numbers of Asian students entering talent searches. For example, in Asian samples, the proportion of males/females with SAT-M ≥ 700 is 4/1 (this ratio has also been observed in China); in Caucasian samples, the ratio is closer to 16/1.

Year		*N*		*N* scoring 700 or above		M/F Ratio
	Total	M	F	M	F	Scores ≥ 700
		Hopkins				
1972–1979	9,927	5,674	4,253	—	—	—
1980–1982	39,820	19,883	19,937	113	9	12.6
1984–1991	243,428	122,185	121,063	622	106	5.7
1997	—	—	—	—	—	4
2005	—	—	—	—	—	3
		Nationwide				
1980–1982	—	—	—	147	11	13
1980–1983	—	—	—	268	23	12
		Duke				
1981–1983	39,754	19,157	20,597	32	3	10.7
1984–1986	73,278	35,424	37,854	54	6	9.0
1987–1989	92,268	44,642	47,626	94	6	15.7
1990–1992	103,097	50,231	52,866	91	33	2.8
1981–1992	308,397	149,454	158,943	271	48	5.6

In 1997, Benbow's co-author Stanley stated that the ratio was 4 to 1. In 2000, Benbow and her colleagues published "Sex Differences in Mathematical Ability at Age 13: Their Status 20 Years Later." This article gives the 13 to 1 ratio without mention of later changes and says, "Sex differences in SAT-M scores among intellectually talented children have persisted."

The 2002 "Mathematically Facile Adolescents With Math–Science Aspirations: New Perspectives on Their Educational and Vocational Development"[v] begins by mentioning strategies intended to solve the "apparent problem" of "male-female disparity in math and science" and says that "many resources have been devoted to equalizing representation between the sexes in various engineering and scientific endeavors." It continues, "In fact, such strategies ignore vital personal-attribute dimensions of human capital relevant to talent development.... Recent longitudinal studies of mathematically precocious young adolescents have revealed some intriguing sex differences in ability and interest." It then cites the 2000 article previously mentioned and two other articles about SMPY.

Concerns about Reporting. Since the 1980s, the majority of Benbow's articles have reported on longitudinal studies of talent search participants identified in the 1970s and early 1980s. The Hopkins talent search was intended to identify "gifted" students who might attend accelerated courses given at the Center for Talented Youth (CTY) at Johns Hopkins University. However, the 2006 "Creativity and Occupational Accomplishments Among Intellectually Precocious Youths: An Age 13 to Age 33 Longitudinal Study"[vi] gives no information about how many of the survey respondents are CTY alumni. If the CTY experience is part of the "treatment" that some survey respondents have received, it must be mentioned; and conclusions about the "predictive power of the SAT" should be modified to conclusions about "the predictive power of the SAT plus (or without) the CTY experience." Such information could be very useful for those concerned about the education of the "gifted."

Concerns about Scientific Method. There is more that can be said and more detail that can be given. Some of that detail appears on the AWM Web site, including full references for the articles cited, but not footnoted.

The 1992 American Psychological Association Code of Ethics said, "Psychologists strive to be aware of their own belief systems, values, needs, and limitations." This is consistent with Popper's comment that "Observation is always selective."[vii] As Popper noted long ago, formulating theoretical systems that connect observations, measures, and concepts and can be tested is essential to science. The concerns discussed above suggest that were Benbow and her colleagues to formulate a theoretical system that included mathematical ability, it would include the hypothesis that mathematical ability is largely fixed and unchanging, unresponsive to learning and effort (much less social forces).[2] It might also include the hypothesis that mathematical ability occurs in fixed gender ratios in different ethnic groups. These assumptions allow the concerns described above to be disregarded, but, like all assumptions in scientific research, they should be revised if there is substantive evidence to the contrary. Given that Benbow and her colleagues rely on the SAT-M as a measure, the drops in talent search ratios would appear to be such evidence.

Acknowledgement. This article has benefited from discussion of its subject matter with the AWM Executive Committee, but does not necessarily express the views of that committee.

[i] Kolata, G. (1980). Math and sex: Are girls born with less ability? *Science*, 210(12), 1234–1235.

[ii] Mathematical ability: Is sex a factor? [Letters to the editor]. (1981). *Science*, 212(4491), 114, 116, 118, 121.

[iii] Schafer, A., & Gray, M. (1981). Sex and mathematics. *Science*, 210 (4479), 231.

[iv] Benbow, C. P., & Benbow, R. M. (1984). Biological correlates of high mathematical reasoning ability. In G. J. De Vries et al. (Eds.), *Progress in Brain Research* (vol. 61, pp. 469–490). Amsterdam: Elsevier.

[v] Webb, R., Lubinski, D., & Benbow, C. P. (2002). Mathematically facile adolescents with math-science aspirations: New perspectives on their educational and vocational development. *Journal of Educational Psychology*, 94(4), 785–794.

[vi] Wai, J., Lubinski, D., & Benbow, C. P. (2005). Creativity and occupational accomplishments among intellectually precocious youths: An age 13 to age 33 longitudinal study. *Journal of Educational Psychology,* 97(3), 484–492.

[vii] Popper, K. (1992). *Conjectures and refutations: The growth of scientific knowledge*. London & New York: Routledge, p. 46, p. 456. (Originally published in 1963)

[2] Psychologist Carol Dweck and her colleagues call those who hold such a view "entity theorists." In contrast, someone who is an incremental theorist with regard to mathematics thinks that mathematical ability is responsive to learning and effort.

IT'S RENEWAL TIME!

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Encourage your colleagues and your department to join!

AWM
ASSOCIATION FOR WOMEN IN MATHEMATICS

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**.

New Associate Director at the IMA

In September Professor Cheri Shakiban will join the Institute for Mathematics and its Applications (IMA) at the University of Minnesota as associate director for a two-year term. Dr. Shakiban succeeds Debra Lewis, who is completing a two-year term of service at the IMA and returning to the University of California, Santa Cruz, where she is professor of mathematics.

Cheri Shakiban is a professor of mathematics at the University of St. Thomas in St. Paul, MN, where she served as department chair from 1996 through 2004. Her recent research is mostly in the area of computer vision, in which she studies the detection of symmetries, visual tracking, and the reconstruction of occlusions in space curves, with applications to the description of supercoiled DNA molecules. At St. Thomas she has been very active in the support and mentoring of undergraduate research.

Shakiban brings valuable experience to the IMA management team, which also includes Douglas Arnold, director, and Arnd Scheel, deputy director. During the academic year 2006–2007 the IMA expects to host well over 1,000 visitors, most in connection with its thematic program on Applications of Algebraic Geometry.

Awards and Honors

Richard Monastersky, a reporter for *The Chronicle of Higher Education*, won the 2005 AAAS Science Journalism Award in the category Small Newspaper. He was chosen based on three of his articles, "Women and Science: The Debate Goes On," 4 March 2005; "The Hidden Cost of Farming Fish," 22 April 2005; and "Come Over to the Dark Side," 3 June 2005. These three unrelated pieces showed a broad grasp of science, from the politically sensitive debate over how boys and girls learn about math to the risks of fish farms to the search by physicists for an elusive force that shapes the universe and accelerates its expansion.

"Monastersky's work stands out for its meticulous explanatory reporting of a remarkably broad range of scientific controversies," said Robert Lee Hotz of the *Los Angeles Times*.

"I am deeply honored that the judges selected my work for the award," Monastersky said. "There are many talented science journalists around the country and it is quite humbling to be selected by my peers." Monastersky, who won a AAAS Science Journalism Award in 2001 as well, said there is "a disturbing trend in the United States for newspapers to be cutting back on their science coverage at a time when the public needs in-depth reporting on this issue more than ever. I hope that both big and small newspapers recognize the importance of covering scientific issues and reverse this dangerous trend."

[Reprinted from http://www.aaas.org/aboutaaas/awards/sja/2005/monastersky.shtml, accessed 15 August 2006. The first article mentioned above was cited in an earlier newsletter piece reporting on the Summers brouhaha.]

Katherine Heinrich (University of Regina) received the Canadian Mathematical Society 2005 Adrien Pouliot Award, which honors individuals, or teams of individuals, who have made significant and sustained contributions to mathematics education in Canada. The most significant achievement of Kathy Heinrich in the area of mathematics education is the idea for a Canadian Mathematics Education Forum as a venue for people interested in mathematics education at all levels (mathematicians, math educators, teachers of mathematics from every level, representatives of school boards, ministries of education, industry, and parents) to meet and talk together about issues of common interest. Three of these forums have been held to date.

Heinrich was a co-organizer of "Women Do Math" (later renamed "Discover the Possibilities"), a conference designed to reach girls in grades 9 and 10 and a co-organizer of "Math in the Malls," a series of displays with hands-on activities, held in several Vancouver area shopping malls in the early 1990s.

Her research interests include graph factoring problems, the design and application of Latin squares and more generally the "mathematics of arrangements" that enable the construction of computer networks, scheduling of tournaments and secure transmission of information.

Yu-Ru Liu (University of Waterloo) received the CMS 2005 G. de B. Robinson Prize, which was inaugurated to recognize the publication of excellent papers in the *Canadian Journal of Mathematics* and the *Canadian Mathematical Bulletin* and to encourage the submission of the highest quality papers to these journals. The 2005 G. de B. Robinson Award is awarded to Liu for her two papers "A Generalization of the Turan Theorem and its Applications" and "A Generalization of the Erdös-Kac Theorem and its Applications" which were published in the *Canadian Mathematical Bulletin* in 2004.

A classical theorem of Hardy and Ramanujan states that the normal number of prime divisors of a natural number n is log log n. Their difficult proof was simplified by Turan in 1934 and was subsequently amplified by Erdos and Kac. In her two papers, Liu shows that the theorems of Turan, as well as the subsequent generalizations by Erdos and Kac, apply to a wider geometric context. Most notable is the application to the study of points on varieties over finite fields. The papers represent an elegant mélange of probability theory, analytic number theory and algebraic geometry.

[Excerpted from http://smc.math.ca/MediaReleases/2005/ap-gbr-prize.html, accessed 15 August 2006.]

AWM Photo Album

Here we will show you some of the faces connected with the names in the report on the AWM-SIAM workshop appearing earlier in this issue. Also, there are a couple of shots from the USAMO (United States of America Mathematical Olympiad) Award Ceremony in May. AWM sponsored a half table, and a delightful time was had by all, according to Jennifer Quinn, AWM Executive Director. Thanks to Jenny for doubling as photographer on these occasions! Captions for the photos follow.

Page 34: Top left: Fan Chung Graham, Akamai Professor in Internet mathematics at UC San Diego and Sherry Gong, two time USAMO medalist. Chung gave the USAMO address, "Graph Theory in the Information Age."

Top right: Cecilia Diniz Behn, Boston University, "A Mathematical Model of Network Dynamics Governing Sleep-Wake Patterns in Mice"

Center left: Seated at the AWM table from left to right are Fern Hunt, NIST; Holly Gaff, University of Maryland; previous multiple USAMO winner Melanie Matchett Wood, Princeton University; Phillip Matchett Wood, Rutgers University; USAMO medalist Sherry Gong, Phillips Exeter Academy; and her mother Liangqing Li

Center right: A full house! Workshop audience

Bottom: Martin Golubitsky (University of Houston), SIAM President; Irene Fonseca (Carnegie Mellon University), Kovalevsky Prize Lecturer; and Barbara Keyfitz (University of Houston and Fields Institute), AWM President, at the Prize Ceremony

Page 35: Top left: Inger Daniels, University of Virginia, "Wellposedness and Control of Nonlinear Structural Acoustic Interactions"

Top right: Workshop Dinner Speaker Erica Voolich

Center left: Presenters and Organizers of "Women at the Interface of Mathematics and Biology": Cymra Haskell, Ami Radunskaya, and Erika Camacho

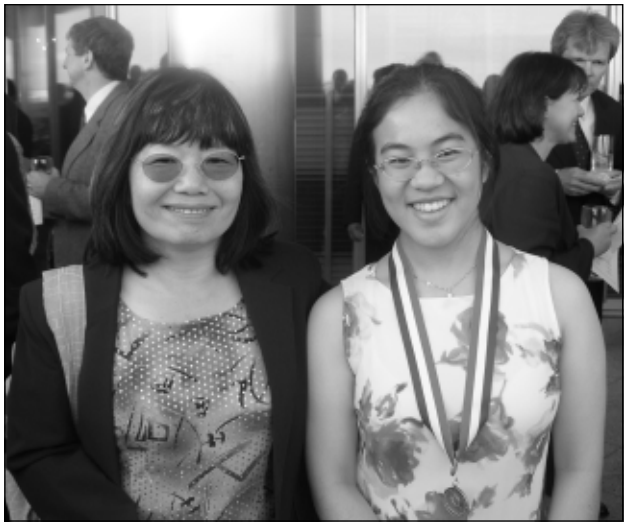
Center right: Hannah Callender, Vanderbilt University at her poster, "Mathematical Modeling of Cellular Signaling in Macrophages: Understanding Pathways"

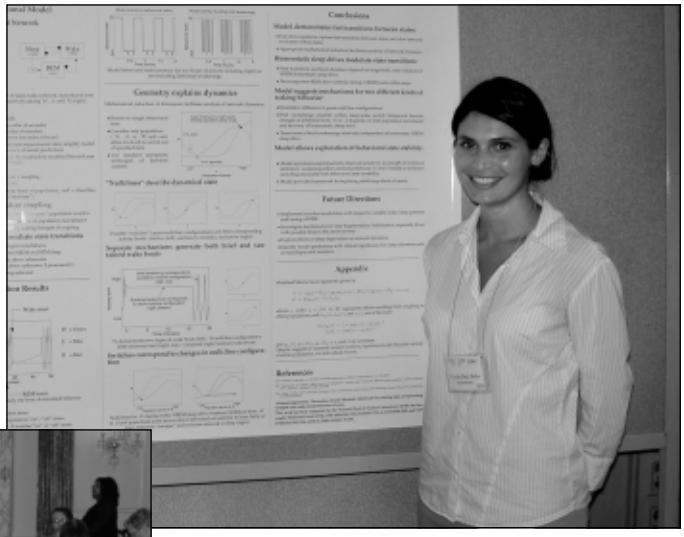
Bottom: Elana Fertig, University of Maryland, explains her poster, "Improving Forecasts for Chaotic Physical Processes by Improving Initial Conditions"

Page 36: Top: "Juggling Eggs," Sigal Gottlieb, Brown University

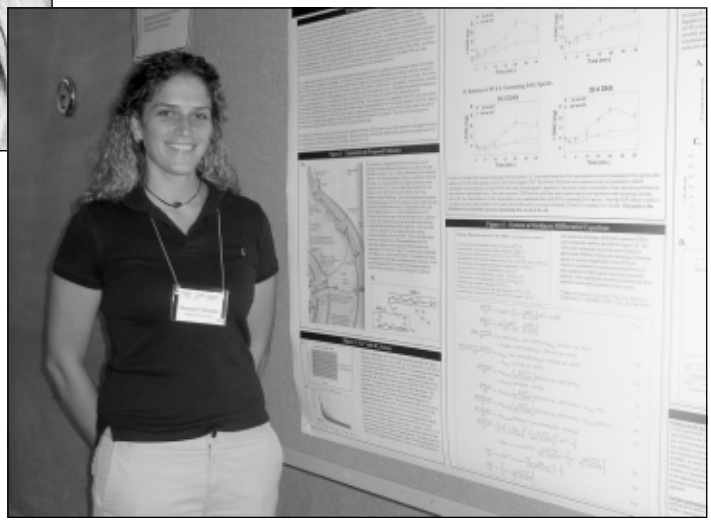
Center: "Playing the Game: What I Have Learned," K. Renee Fister, Murray State University

Bottom: Kristen Moore (L) with Gloria Haro (R)






The BOSTON



Director of Publications for Journals and Communications

Mathematical Association of America • Washington, DC

The Mathematical Association of America (MAA) seeks a Director of Publications for Journals and Communications. The primary responsibilities of the position are to oversee journals and other periodicals and content and resources on the MAA website. In addition, the Director will perform other duties related to communications of the MAA to our members, the public, and other specific constituencies. Candidates should have a Ph.D. in the mathematical sciences. Requirements include editorial experience, writing articles for journals, periodicals, and the web, and an interest in creating web content. Candidates should be familiar with the MAA, have a strong interest in writing and publication, and express a vision for MAA periodical publications in print and online.

More information about this position and about the MAA may be found at www.maa.org. Applications will be accepted and reviewed as received. It is expected that the position will begin July 1, 2007, though a January start date will be considered. Candidates should send a resume and letter of interest to:

Ms. Calluna Euving
Mathematical Association of America
1529 18th Street, NW
Washington, D.C. 20036
Email: ceuving@maa.org

References will be requested after review of applications. Applications from individuals from underrepresented groups are encouraged. AA/EOE.

Associate Director for Student Activities

Mathematical Association of America • Washington, D.C.

The Mathematical Association of America (MAA) seeks an Associate Director for Student Activities. The Association, with nearly 30,000 members, is dedicated to the advancement of mathematics, particularly at the collegiate level. The Associate Director will oversee a wide range of activities for both undergraduate and graduate students and develops new initiatives to advance the MAA in the area of student services and programs.

Candidates should have an advanced degree in one of the mathematical sciences, and experience working with students both in and outside of the classroom through math clubs and/or mentoring undergraduate research. Experience using on-line instruction or development of web content is a plus.

More information about this position and about the MAA may be found at www.maa.org. Applications will be accepted and reviewed as received, but it is expected that the position will begin July 1, 2007, though a January start date will be considered. Candidates should send a resume and letter of interest to:

Ms. Calluna Euving
Mathematical Association of America
1529 18th Street, NW
Washington, D.C. 20036

Applications may be submitted electronically to ceuving@maa.org. References will be requested after review of applications. Applications from individuals from underrepresented groups are encouraged. AA/EOE.

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BROWN UNIVERSITY, DIVISION OF APPLIED MATHEMATICS — The Division of Applied Mathematics at Brown University seeks applicants at the tenure track at (Assistant Professor) or tenured (Associate Professor) level in the general area of stochastic PDEs. See the Division web site at **www.dam.brown.edu** for full posting.

BROWN UNIVERSITY -— MATHEMATICS DEPARTMENT — J.D. Tamarkin Assistant Professorship: One three-year non-tenured non renewable appointment beginning July 1, 2007. The teaching load is one course one semester, and two courses the other semester and consists of courses of more than routine interest. Candidates are required to have received a Ph.D. degree or equivalent by the start of their appointment, and they may have up to three years of prior academic and/or postdoctoral research experience. Applicants should have strong research potential and a commitment to teaching. Fielf of research should be consonant with the current research interests of the department. For full consideration, a curriculum vitae, an AMS Standard Cover Sheet, and three letters of recommendation must be received by **December 1, 2006**. All inquiries and materials should be addressed to: Junior Search Committee, Department of Mathematics, Brown University, Providence, RI 02912.

BROWN UNIVERSITY, MATHEMATICS DEPARTMENT — The Mathematics Department at Brown University invites applications for two positions at the level of Associate or Full Professor to begin July 1, 2007. We seek to fill one of the positions in the area of analysis, broadly construed. Candidates should have a distinguished research record and a strong commitment to excellence in undergraduate and graduate teaching. Preference will be given to applicants with research interests consonant with those of the present members of the Department. For more information see: **http://www.math.brown.edu/faculty/faculty.html**. Qualified individuals are invited to send a letter of application and a curriculum vitae to: Senior Search Committee, Department of Mathematics, Box 1917, Brown University, Providence, Rhode Island 02912. Applicants for Full Professor should include the names of five references who would be contacted at the appropriate time by the Search Committee. Applicants for Associate Professor should have three letters of reference sent at the time of application. Applications received by **October 30, 2006** will receive full consideration, but the search will remain open until the positions are closed or filled. For further information or inquiries, write to srsearch@math.brown.edu. Brown University is an Equal Opportunity/Affirmative Action employer and encourages applications from women and minorities.

COLLEGE OF WILLIAM & MARY, MATHEMATICS DEPARTMENT — Two tenure-track positions at the assistant or associate level, beginning August 2007. One is in biomathematics. Ph.D. in mathematics or related field required. Successful candidate will be involved in scholarly and educational outreach to programs in the departments of biology and applied science, and to William and Mary's Virginia Institute for Marine Science, and will be a leader in the mathematics department's biomathematics group (consisting of three tenure-track faculty and two post-docs). The second position is in statistics and probability, requires research expertise in biological applications of statistics and probability, and Ph.D. in statistics or related field. Incumbents will work with Mathematics Department faculty to support and develop statistics course offerings, and to perform on-campus statistical consulting. Candidates for either position must have demonstrated strong record in research and grantsmanship, and strong teaching credentials. See www.math.wm.edu for departmental profile. Submit application letter, CV, AMS cover sheet, research description, and three or more recommendation letters (at least one concerning teaching) to: Biomath Search (or Statistics Search), Mathematics Department, P.O. Box 8795, William & Mary, Williamsburg, VA 23187-8795. Review begins November 30 and continues until appointment is made. W&M is an AA/EEO employer.

COURANT INSTITUTE, DEPARTMENT OF MATHEMATICS — The Courant Institute Department of Mathematics anticipates having a small number of faculty positions in mathematics to begin in September 2007. Appointments may be made at either a junior or senior level. These positions will be in a range of areas in computational, applied and pure mathematics; one particular area of interest is computational statistics. Some may be multidisciplinary appointments that are joint with a science department from the Faculty of Arts and Sciences. Applications and supporting documents should be received by **January 6, 2007**. For more information regarding submitting an application please visit **http://www.math.nyu.edu/jobs/**. The Courant Institute/New York University is an Equal Opportunity/Affirmative Action Employer.

COURANT INSTITUTE, DEPARTMENT OF MATHEMATICS — The Courant Institute is a center for advanced training and research in the mathematical sciences. It has long been an international leader in mathematical analysis, differential geometry, probability theory, applied mathematics, and scientific computation, with special emphasis on partial differential equations and their applications. Its scientific activities include an extensive array of research seminars and advanced graduate courses. Each year a limited number of Courant Institute Instructorships in the Department of Mathematics are awarded to postdoctoral scientists. These appointments carry a light teaching load of one course per semester and ordinarily are for a three-year term. These positions are primarily for recent Ph.D.'s and candidates must have a degree in mathematics or some affiliated field. For more information please visit: **http://www.math.nyu.edu/visiting_faculty**. Applications and supporting documents are due by **December 15, 2006** for appointments to begin the following academic year. The Courant Institute at New York University is an Equal Opportunity/Affirmative Action Employer.

DARTMOUTH COLLEGE — John Wesley Young Research Instructorship, 2-3 years, new or recent Ph.D. graduates whose research overlaps a department member's. Teach 4 ten-week courses spread over 3 terms. Appointment for 26 months, with possible 12 month renewal; monthly salary of $4,650.00, including two-month research stipend for Instructors in residence during 2 of 3 summer months; if not in residence, salary adjusted accordingly. Applications may be obtained at **http://www.math.dartmouth.edu/recruiting/**. Or, send letter of application, curriculum vitae, graduate school transcript, thesis abstract, statement of research plans and interests, and at least three, preferably four, letters of recommendation to Annette Luce, Department of Mathematics, Dartmouth College, 6188 Kemeny Hall, Hanover, New Hampshire 03755-3551. Files complete by **January 5, 2007** considered first. Dartmouth College is committed to diversity and strongly encourages applications from women and minorities.

DARTMOUTH COLLEGE — Tenure-track Mathematics Assistant Professorship beginning 2007-2008. In extraordinary cases, appointment at higher rank is possible. Candidates should be working in discrete or combinatorial mathematics with connections to existing research interests in the department. Examples include discrete probability, graph theory, algebraic combinatorics, combinatorial number theory, and discrete geometry. In exceptional circumstances, other research areas may be considered. Candidates must have strong commitment to outstanding teaching and interaction with students at all levels of undergraduate and graduate study. New faculty members are offered grants for research-related expenses, one quarter of sabbatical leave for each three academic years in residence, and flexible scheduling of teaching responsibilities. Teaching load is three courses spread over three of four ten-week terms. Applications may be obtained at **http://www.math.dartmouth.edu/recruiting/**. Or, send application letter, vita, research statement, four recommendation letters (one teaching), to Annette Luce, Department of Mathematics, Dartmouth College, 6188, Kemeny Hall, Hanover, NH 03755-3551. Applications completed by **December 15, 2006** considered first. Women and minorities encouraged to apply.

ADVERTISEMENTS

SOUTHERN ILLINOIS UNIVERSITY CARBONDALE, DEPARTMENT OF MATHEMATICS — Applications are invited for a tenure-track position at the rank of associate professor to begin on August 16, 2007, to support the department's programs in mathematics education as part of an on-going Teaching Excellence in Mathematics and Science initiative. The person hired into this position will be expected to seek external funding in the area of mathematics education and to maintain an active research program. Teaching and service duties of the position will involve the training of teachers at the elementary and secondary levels. Applicants must demonstrate a record of established research productivity in an area of pure or applied mathematics and a record of teaching excellence commensurate with the rank of associate professor, have an established record of success in acquiring external grants and/or contracts, and have an interest in and aptitude for educating prospective teachers of mathematics. Ph.D. in pure or applied mathematics required by **August 15, 2007**. To apply, please send letter of application, curriculum vitae and statements of research and teaching interests, and have three letters of recommendation sent, to: Mathematics Education Position, Department of Mathematics, Mail Code 4408, Southern Illinois University Carbondale, 1245 Lincoln Drive, Carbondale, IL 62901. Review of applications will begin November 27, 2006, and continue until position is filled. SIUC is an affirmative action/equal opportunity employer that strives to enhance its ability to develop a diverse faculty and staff and to increase its potential to serve a diverse student population. All applications are welcomed and encouraged and will receive consideration.

TEXAS A&M UNIVERSITY, DEPARTMENT OF MATHEMATICS — The Department of Mathematics is in the fourth year of an aggressive four-year hiring plan to increase its tenured and tenure-track faculty by 25%. As part of this effort, we anticipate several openings for tenured, tenure-eligible, and visiting faculty positions beginning fall 2007. The field is open, but we particularly seek applications from individuals whose mathematical interests would augment and build upon existing strengths both within the Mathematics Department as well as other departments in the University. Salary, teaching loads and start-up funds are competitive. For a Tenured Position the applicant should have an outstanding research reputation and would be expected to fill a leadership role in the department. An established research program, including success in attracting external funding and supervision of graduate students, and a demonstrated ability and interest in teaching are required. Informal inquiries are welcome. For an Assistant Professorship, we seek strong research potential and evidence of excellence in teaching. Research productively beyond the doctoral dissertation will normally be expected. We also have several visiting positions available. Our Visiting Assistant Professor positions are for a three year period and carry a three course per year teaching load. They are intended for those who have recently received their Ph.D. and preference will be given to mathematicians whose research interests are close to those of our regular faculty members. Senior Visiting Positions may be for a semester or one year period. The complete dossier should be received by **December 15, 2006**. Early applications are encouraged since the department will start the review process in October. Applicants should send the completed "AMS Application Cover Sheet", a vita, and arrange to have letters of recommendation sent to: Faculty Hiring, Department of Mathematics, Texas A&M University, College Station, Texas 77843-3368. Further information can be obtained from: **http://www.math.tamu.edu/hiring**. Texas A&M University is an equal opportunity employer. The University is dedicated to the goal of building a culturally diverse and pluralistic faculty and staff committed to teaching and working in a multicultural environment and strongly encourages applications from women, minorities, individuals with disabilities, and veterans. The University is responsive to the needs of dual career couples.

UNIVERSITY OF CALIFORNIA, SANTA CRUZ, MATHEMATICS DEPARTMENT — The Mathematics Department at the University of California, Santa Cruz expects to have one tenure track Assistant Professor position available in the area of Mathematical Aspects of String Theory (including Gromov-Witten invariants and Mirror symmetry); subject to availability of funding. Candidates in other areas of Mathematical Physics may also be considered. Appointees will be expected to teach, pursue their research and perform department and university service. The teaching load is four one-quarter courses per year. We invite applications from qualified mathematicians. The campus is especially interested in candidates who can contribute to the diversity and excellence of the academic community through their research, teaching and/or service. Rank: Assistant Professor (9 month basis, step and salary commensurate with qualifications and experience). Minimum qualifications: Ph.D. or equivalent by 6/30/07 in Mathematics or Physics; demonstrated achievements or potential for excellence in research, teaching, and professional service. Position available: July 1, 2007. Deadline: Hardcopy application materials and reference letters must be postmarked by **November 10, 2006**. Applicants must submit hard copies of a Curriculum Vitae, a research statement, a teaching statement, and four letters of recommendation (at least one letter must address teaching experience and ability). Letters of recommendation will be treated as confidential documents (Please direct your letter writers to the UCSC Confidentiality Statement at **http://www2.ucsc.edu/ahr/policies/confstm.htm**. All applications should be sent to: Faculty Recruitment Committee, Mathematics Department, University of California, 1156 High Street, Santa Cruz, CA 95064. Please refer to position #718-07 in your reply. Inquiries [not applications] can be sent to mathrcr@ucsc.edu. UCSC is an EEO/AA employer. See **http://www.math.ucsc.edu/about/jobs.html** for complete job description.

UNIVERSITY OF CONNECTICUT, DEPARMENT OF MATHEMATICS — The Department of Mathematics anticipates openings for two tenure-track positions at the Assistant Professor level starting Fall 2007. An appointment at higher levels is possible in exceptional cases. Candidates must have a Ph.D. and demonstrate evidence of excellent teaching ability and outstanding research potential. We seek to hire primarily in the areas of Probability and Applied and Computation Mathematics. In the area of Applied Computational Mathematics preference will be given to candidates whose research interests lie in Numerical PDE's, and/or Optimization, and/or Wavelets. Review of applications will begin **November 15, 2006** and continue until the position is filled. We prefer that applications be submitted online at **http://www.mathjobs.org/jobs**. Applicants may also choose to send resume and at least three letters of recommendation to: Hiring Committee, University of Connecticut, Department of Mathematics, U-3009, 196 Auditorium Road, Storrs, CT 06269. The University of Connecticut is an Equal Opportunity and Affirmative Action Employer. We enthusiastically encourage applications from underrepresented groups, including minorities, women and people with disabilities. For more information about the position or institution/company: **http://www.math.uconn.edu**.

UNIVERSITY OF CONNECTICUT, DEPARMENT OF MATHEMATICS — The Department of Mathematics anticipates an opening for a tenure-track position at the Assistant Professor level starting Fall 2007 with special responsibilities in Actuarial Science. These responsibilities normally include teaching two actuarial related courses each semester, assisting with program administration, and conducting research. An appointment at higher levels is possible in exceptional cases. The Department has a strong actuarial program, awarding Bachelor's, Master's, and Ph.D. degrees. Qualifications to be considered include: excellence in teaching, a Ph.D. in the Mathematical Sciences or Actuarial Science, membership in one of the actuarial societies, an active research program, and industry experience. Salary is commensurate with experience. Review of applications will begin **January 1, 2007** and continue until the position is filled. We prefer that applications be submitted online at **http://www.mathjobs.org/jobs**. Applicants may also choose to send resume and at least three letters of recommendation to: Actuarial Hiring Committee, University of Connecticut, Department of Mathematics, U-3009, 196 Auditorium Road, Storrs, CT 06269. The University of Connecticut is an Equal Opportunity and Affirmative Action Employer. We encourage applications from underrepresented groups, including minorities, women and people with disabilities. For more information about the position or institution/company: **http://www.math.uconn.edu**.

ADVERTISEMENTS

UNIVERSITY OF CONNECTICUT, DEPARMENT OF MATHEMATICS — The Department of Mathematics anticipates openings for Postdoctoral Fellow positions beginning in Fall, 2007. Candidates must have received a Ph.D. within the last four years and demonstrate evidence of excellent teaching ability and outstanding research potential. The positions are for a maximum of three years. Postdoctoral Fellows normally teach two courses a semester and are expected to participate in the research activities of the department. Preference will be given to candidates whose research interests intersect those of the permanent faculty. The review of applications will begin January 1, 2007. We prefer that applications be submitted online at **http://www.mathjobs.org/jobs**. Applicants may also choose to send resume and at least three letters of recommendation to: Postdoctoral Hiring Committee, University of Connecticut, Department of Mathematics, U-3009, 196 Auditorium Road, Storrs, CT 06269. The University of Connecticut is an Equal Opportunity and Affirmative Action Employer. We encourage applications from underrepresented groups, including minorities, women and people with disabilities. Deadline for Applications: **March 31, 2007**. For more information about the position or institution/company: **http://www.math.uconn.edu**.

UNIVERSITY OF CONNECTICUT, DEPARMENT OF MATHEMATICS — The Department of Mathematics at the University of Connecticut announces the availability of a tenure track Assistant Professor position at the Avery Point regional campus starting in August 2007. Located on the shore of Long Island Sound, UConn Avery Point serves as the University's campus by the sea. The campus hosts the extensive research and graduate/undergraduate teaching programs of its outstanding marine science department. The campus also offers undergraduate degree programs in coastal, maritime, and american studies complemented by masters and doctoral programs in oceanography and a full complement of general education courses. The department and campus seek an applied mathematician with a Ph.D. in mathematics, or closely related area, and demonstrated research experience and capability in the numerical solution of partial differential equations. Candidates with interests in the areas of mathematical modeling in meteorology, oceanography, fluid dynamics, marine ecology, or optimization problems in data assimilation will be preferred. The successful candidate will be expected to teach mathematics courses at the undergraduate and graduate levels. The successful candidate will also be expected to develop a vigorous externally-funded research program, preferably while working in collaboration with appropriate marine science and/or mathematics colleagues. Integration with the graduate programs in the marine science and mathematics departments will also be encouraged. The review of applications will begin **January 1, 2007**. Please submit a comprehensive CV, a letter describing your scholarly goals, research plans, teaching experience and philosophy, and arrange for four letters of reference to be submitted on your behalf. We prefer that applications be submitted online at **http://www.mathjobs.org/jobs**. Applicants may also choose to send resume and letters of recommendation to: Professor P. Joseph McKenna, University of Connecticut, Department of Mathematics, U-3009, 196 Auditorium Road Storrs, CT 06269.

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AWM
ASSOCIATION FOR WOMEN IN MATHEMATICS

11240 Waples Mill Road
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(703) 934-0163
http://www.awm-math.org
awm@awm-math.org

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The *AWM Newsletter* is published six times a year and is part of your membership. Any questions, contact AWM at awm@awm-math.org; (703)934-0163 or refer to our website at: http://www.awm-math.org.

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