PRESIDENT'S REPORT

Ah, the merry month of May. Time for taking and grading exams, for those of us who are students and teachers. Time for admiring the flowers and for enjoying walks. Past time to have submitted applications for AWM Travel Grants (the deadline was May 1), but not too late to start thinking about applying during the next cycle (with a deadline of October 1). Not too soon to start thinking about applying for the AWM Workshop at the Joint Mathematics Meetings in New Orleans next January (deadline is September 1)! And certainly not too soon to think about attending the upcoming AWM-sponsored events of the summer: the AWM Workshop at the SIAM annual meeting in Puerto Rico (July 9–11), the AWM-MAA lecture of Audrey Terras and the AWM reception at the Mathfest (August 3–5), the AWM panel at the AMS-sponsored meeting "Mathematical Challenges of the 21st Century" (August 7–12), and the IMA/AWM Career Workshop "Connecting Women in Mathematical Sciences to Industry" at the IMA, University of Minnesota (September 8-10). For more information on these programs, look elsewhere in this issue or see the AWM web site, www.awm-math.org.

Speaking of the website, I encourage you to take a look at, and if possible participate in, the various on-line forums AWM is running. The most recent one is an outgrowth of last January's panel discussion "How to Increase the Number of Tenured Women in Mathematics Departments." Perhaps as a result of the earlier forum on girls and mathematics competitions, I've been invited to participate in a panel discussion on math competitions at the NCTM (National Council of Teachers of Mathematics) annual meeting.

I'd also like to call your attention to the reports in this issue by the AWM Scholars at the AAAS Annual meeting. Five such students were chosen this year and had their registration, housing, and some meals paid for by AWM, with the students' home institutions contributing their other travel expenses. One student came on her own. Section A (Mathematics) of AAAS also contributed by paying for a dinner for these students. In return the students

wrote out reports on the symposia sponsored by Section A. As part of the scholars program, there were daily seminars featuring many of the organizers of these symposia. The post-meeting evaluations indicated that the students found these very useful, as they provided a chance to discuss with a wide variety of mathematicians some of the issues surrounding being a woman in mathematics. It is likely that AWM will run such a program again next year; watch the website for an announcement and for the application deadline, which will likely be at the beginning of October.

I close with a bit of unheralded history concerning May and some women in mathematics: For more than twenty-five years, there has been a Mathematicians May Day Relay Race on the 26-mile towpath along the Delaware and Raritan Canal between Princeton and Rutgers. There are seven official legs to this race, from 2.1 to 4.3 miles in length, and every year there have been at least four, and as many as seven, teams of mathematicians (plus ringers!) entered, usually affiliated with either Rutgers or Princeton. One year I decided to have a Rutgers women-only team. And I did put one together, with *no* ringers (apart from including computer science as part of mathematics); four of the seven of us were even tenured. I was very proud of the existence of this team, given that Princeton at that time had, unlike today, no tenured women in mathematics or computer science. It's true that we recorded the all-time slowest record with this team — for example, Tilla Weinstein walked her 2.1 mile leg — but we did field a legitimate team of all women mathematicians.

I wish you all a pleasant and productive time, for the rest of the spring and the summer.

Jean Taylor
Princeton, NJ
March 27, 2000
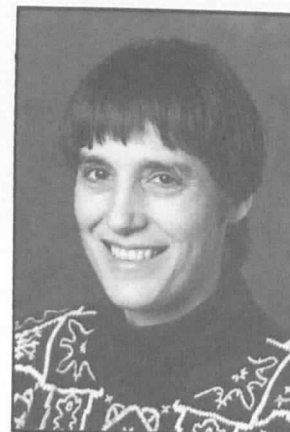
IN MEMORIAM

Donna M. Carr, University of Wisconsin Parkside, died suddenly at her home February 24, 2000. She was on sabbatical for the spring. Among her papers as a logician specializing in set theory were "$P_{\kappa\lambda}$-partition relations" and "A note on the λ-Shelah property" in *Fundamenta Mathematica*. She earned her Ph.D. from McMaster University. During her years at Parkside, she served as Chair of the department, as a faculty member of the Women's Studies Program, and as a member of numerous university committees, including the Honors Program Steering Committee and the Graduate Studies Committee of the Faculty Senate.

AWARDS AND HONORS

CONGRATULATIONS to the women listed below for their meritorious achievements!

INGRID DAUBECHIES has received the National Academy of Sciences Award in Mathematics for 2000. It is awarded every four years in recognition of excellence of research in the mathematical sciences published within the last ten years. Daubechies was chosen "for fundamental discoveries on wavelets and wavelet expansions and for her role in making wavelet methods a practical basic tool of applied mathematics." This award was established by the American Mathematical Society in commemoration of its centennial and has been presented since 1988.

The third G. de B. Robinson Award was presented to RANEE BRYLINSKI, Pennsylvania State University. She received her A.B. degree from Princeton University in 1977 and her Ph.D. from M.I.T. in 1981. Brylinski was awarded NSF and NATO postdoctoral fellowships and a Sloan Foundation Fellowship. She taught at Brown University from 1982–88 and then moved to Penn State where she is now Professor of Mathematics and Co-director of the Center for Geometry and Mathematical Physics. Her research interests are geometry, representation theory, and mathematical physics.

AWM DEADLINES

NSF-AWM Travel Grant: October 1, 2000; February 1, 2001

AWM Workshop, New Orleans: September 1, 2000

Louise Hay Award: October 1, 2000

Alice T. Schafer Prize: October 1, 2000

AWM CALENDAR

AWM Workshop, SIAM meetings, Puerto Rico, July 9–11, 2000

AWM-MAA Lecture, Mathfest, August 3–5, 2000

AWM panel, AMS summer meeting, August 7–12, 2000

IMA/AWM Workshop, September 8–10, 2000

The G. de B. Robinson Award, first presented in 1996, recognizes the publication of outstanding papers in the *Canadian Journal of Mathematics* and the *Canadian Mathematical Bulletin.*

The Alfred P. Sloan Foundation has announced the names of the 1999 Sloan Dissertation Fellows. The awards provide full tuition and a stipend for the dissertation year. Recipients include: MELANIE BERTELSON, Stanford University; OLGA HOLTZ, University of Wisconsin; IRINA S. MITREA, University of Minnesota; and RACHEL J. PRIES, University of Pennsylvania.

PADMA RAMANUJAM, who received her Ph.D. from the University of Massachusetts at Amherst, was awarded the 1999 Transportation Science Dissertation Prize during the national meeting of INFORMS held in November in Philadelphia. The competition is an international one. Ramanujam's dissertation, "Transportation Network Policy Modeling for Congestion and Pollution Control: A Variational Inequality Approach," was supervised by ANNA NAGURNEY, the John F. Smith Memorial Professor at the Isenberg School of Management at UMass. This award, the oldest and most prestigious honor for doctoral dissertations in transportation, included a brass plaque and a $500 certificate. Dr. Ramanujam also holds a Master's degree in Mathematical Sciences from Clemson University; Professor Nagurney received her Ph.D. in Applied Mathematics from Brown University. Dr. Ramanujam is presently employed by I2 Technologies, a logistics company headquartered in Texas.

LISA BETH SCHWARTZ, a seventeen-year-old student at Roslyn High School in Roslyn Heights, NY won a $20,000 scholarship in the 1999 Intel Science Talent Search for her project "Positive Integer Sequences Satisfying a Determinant Condition."

Each year in a random drawing four geographically distributed schools are selected for the opportunity to present a Trjitzinsky Memorial Award to a needy student in mathematics. Three of these awards went to women this year.

City University of New York (CUNY) selected HULYA CEBECIOUGLU, a student from Turkey, to receive the award. After studying English at the University of Texas and obtaining a master's degree in mathematics from Brooklyn Polytechnic Institute, she entered the Ph.D. program at CUNY in 1997. Her area of research is partial differential equations.

DANIELLE LYLES, a first generation college student, received the award from the University of Texas at San Antonio, which by matching the award makes it possible for Lyles to concentrate full-time on her studies. She is working on an honors thesis with math faculty member Mary Lou Zeeman, who called Lyles "extremely talented." Lyles's thesis focuses on modeling follicular growth and selection in the human menstrual cycle.

MARCIA JEAN MERCER of New Britain, CT was chosen by Western Kentucky University. After dropping out of high school after ninth grade, she later completed her GED and was named Kentucky GED student of the year. Still serving as volunteer math tutor at the GED center, she began her studies in mathematics at Western Kentucky in August 1996. This year she was named the outstanding junior in mathematics. Her career plans are to obtain a Ph.D. in mathematics and become a college professor.

MELANIE WOOD was again a medalist in the International Mathematical Olympiad, earning a silver medal at the competition held in Bucharest in July 1999.

Our President JEAN E. TAYLOR, Rutgers University, was elected to membership in the American Academy of Arts and Sciences in 1999. The Academy was founded in 1780 to foster the development of knowledge to promote the public interest and social progress. The membership of the academy is elected and represents distinction and achievement in a range of intellectual disciplines.

MAA Section Distinguished Teaching Awards were conferred at the Spring meetings of the sections. Our treasurer, AMY COHEN, Rutgers University, received the New Jersey Section Award. JOANNE DARKEN, Community College of Philadelphia, received the Eastern Pennsylvania/Delaware Section Award; KALPANA A. GODBOLE, Michigan Technological University, the Michigan Section Award; and RHONDA MCKEE, Central Missouri State University, the Missouri Section Award.

In September 1999, the Council of the American Association for the Advancement of Science elected the following mathematicians as Fellows of the AAAS: ETTA ZUBER FALCONER, for a lifetime of distinguished and dedicated service to the scientific enterprise, and for inspiring generations of minority students and women in mathematics and science, and SUSAN LANDAU, for her distinguished work in symbolic computation and for effectively communicating, to scientists, congress, and the public, sociopolitical issues and concerns involving privacy and encryption. The Fellows were honored at the AAAS annual meeting in February.

Privacy on the Line: The Politics of Wiretapping and Encryption, by WHITFIELD DIFFIE (not a woman but a co-author with one!) and SUSAN LANDAU, has received the 1999 Communication Policy Research Award sponsored by the Donald McGannon Communication Research Center at Fordham University.

LINDA R. PETZOLD of the University of Minnesota has been awarded the third Germund Dahlquist Prize by SIAM. Her citation reads in part:

> for her important contribution to effective numerical methodology for differential equations, especially the analysis of methods for differential-algebraic equations, the construction of effective techniques for their solution, and the integration of these and other techniques into robust software,

thus making possible the reliable solution of large classes of ordinary and partial differential equations arising from engineering and science applications.

The Dahlquist Prize was established in 1995 to be awarded to a young scientist (normally under forty-five years old) for original contributions to fields associated with Germund Dahlquist, especially the numerical solution of differential equations and numerical methods for scientific computing. The prize carries a cash award of approximately $1000 and is given every two years.

The AMS again presented Karl Menger Memorial Awards at the Intel-International Science and Engineering Fair; the 1999 Fair was held in May in Philadelphia. JENNIFER LYNN PELKA, junior, Lake Highland Preparatory School, Orlando, FL received a Second Place award ($500) for her project "Hamiltonicity of Graphs of Self-Complementary Degree Sequences." Pelka also received a scholarship from Lehigh University for her project. Third Place awards ($250 each) went to JENNIFER ROSE WALK, "Which Factors Affect Noninsulin Dependent Diabetes Mellitus in China?" junior, Suncoast High Community School, Riviera Beach, FL and HEIDI LEE WILLIAMS, "Applying Statistical Language Recognition: Techniques in the Cybertext-only Cryptanalysis of Enigma," senior, Williston Senior High School, Williston, ND.

BEVERLY J. BAARTMANS of Michigan Techological University has received a three-year grant under the NSF Graduate Teaching Fellows in K–12 Education (GK–12) program. She will receive an annual stipend of $18,000 plus a cost-of-education allowance. According to NSF director Rita Colwell,

> The GK–12 program will boost the content of elementary and secondary education and the quality of graduate and undergraduate education at the same time. This is a very practical approach: graduate and advanced undergraduate students will get direct classroom experience; young scientists will get involved in the educational process at an early stage in their careers; and the program gives recognition to teaching in a scientific career.

Academic institutions offering graduate degrees in science, mathematics, and engineering are eligible to apply for the awards. The institutions are responsible for selecting the teaching fellows.

The Science and Mathematics Investigative Learning Experience (SMILE) program at Oregon State University, directed by SUSAN J. BORDEN, has received a 1999 Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. Administered and funded through the NSF, the awards recognize outstanding individual efforts and organizational programs designed to increase the participation of underrepresented groups in mathematics, engineering, and science from kindergarten through twelfth grade and on through the graduate level. Up to ten individuals and ten institutions annually may qualify for the award, which includes a $10,000 grant and a commemorative presidential certificate.

ROBIN DRIESNER, Southern Illinois University; SARA LALUMIA, Youngstown State University; TERESA SELEE, Youngstown State University; and LIBBY WIEBEL, St. Norbert College, all received an AMS Award for Outstanding Pi Mu Epsilon Student Paper Presentation at the MathFest in Providence held July 31 to August 2, 1999.

The Mathematical Sciences Postdoctoral Research Fellowship program of the Division of Mathematical Sciences of the National Science Foundation has announced the recipients of its fellowships for 1999. The following list gives names, Ph.D. institution in parentheses, and institution at which the postdoc will be used: REBECCA GOLDIN (Massachusetts Institute of Technology), University of Maryland, College Park; MARIA MARTINEZ (University of California, San Diego), Pennsylvania State University; ANNE SHEPLER (University of California, San Diego), University of Wisconsin, Madison; KRISTIN SWANSON (University of Washington), University of California, San Francisco; and MONICA VAZIRANI (University of California, Berkeley), University of California, San Diego.

MEA CULPA: Through an editorial misunderstanding, a shortened version of the article "Meandering Mathematical Career Paths" by Dianne O'Leary which she had submitted solely to SIAM *News* appeared in the January–February issue of this *Newsletter*. We apologize to Dianne and to SIAM for this unfortunate error on our part.

EDUCATION COLUMN

On Conversation

I have always believed in the power of conversation in personal life, not to mention the pleasure thereof. It took a number of years, though, before I began to see how that belief applied to professional life. When I did, I still ran into some difficulties of articulation. "Ginger, what do you expect will come of this conversation if you do arrange it?" "Well, uh...." Now I can give a much firmer reply: "I wouldn't dare predict what, but I can just about guarantee that something positive will." Recent examples of several sorts have helped confirm this view.

Twice this year our NSF project, "Creating a Community of Mathematics Learners" (CCML), has invited high school teachers from several nearby school districts to the University of Washington campus for a day's visit. The visits are billed as an opportunity for them to observe classes and see what it is their students are heading for, and indeed it does have that function. The most interesting comments and reflections, however, have come from the lunchtime they shared with the faculty members who taught the courses they observed. The high school teachers have come away with a much deeper understanding of the demands both by and on the mathematics department, and the faculty members have increased their insights into high school teaching, not to mention their interest in it. Perhaps the best of the outcomes was one I could have hoped for but in no way could have planned — the parting remark of one of our guests: "I had no idea there were university professors who cared that much about their students."

Conversation on a grander scale took place on a recent weekend at the third annual gathering of WaToToM (Washington Teachers of Teachers of Mathematics). Two dozen people from all across the state converged with the sole and entire purpose of talking with each other. Our common thread was involvement in teacher education, an involvement which took many forms. We had people from mathematics departments and education departments and departments that combine the two; people from two-, four- and more-year institutions; elementary school teachers; graduate

by Column Editor Ginger Warfield, Department of Mathematics, University of Washington, Seattle, WA 98195; warfield@math.washington.edu

students — lots of variety. The programming existed entirely as a mechanism to launch, or occasionally shape, conversation. Perhaps the best measure of success was the level of difficulty getting people from one place to another. Nobody would move, because they were too busy talking. I can't report on most of the individual conversations, but one example from a general discussion serves to illustrate the nature of the discourse: a group from a community college, recognizing how many future elementary school teachers pass through their portals, has gotten NSF support to set up a course sequence designed as preparation for university level teacher preparation programs. Their hope is to involve as many as possible of the state's community colleges and universities in this project, and judging by the "Wow!"s at WaToToM, they are now several steps further along that route.

That was an example of a large-scale conversation which will manifestly give rise to wide-ranging consequences that may or may not be traceable to it. At the other end of the scale is a conversation whose ramifications are completely traceable and to me quite stunning. Like the first of the examples above, it began with a CCML event, in this case the 1997 orientation session

that kicked off the whole project. Members of the mathematics and applied mathematics departments at the University of Washington were invited to help create that community by joining us for lunch. One applied mathematician who took up the offer was Loyce Adams. She had a long chat with Aaron Feik, director of mathematics curriculum for one of the local school districts, and thoroughly enjoyed it. More than a year passed before she got a phone call beginning "I don't know who you are, but you are just who I need." It seems Aaron's district was deciding on a curriculum adoption, and he wanted the opinion of someone who used mathematics rather than just doing it. He had found in his notebook a record of a conversation with an applied mathematician, and with it her name and phone number. Would she help in the curriculum study? Loyce replied that that was too large a task for one person, but there was some chance that she might interest a few graduate students and turn the exploration into a seminar. Somewhat skeptically she put out an email offer of such a seminar, and within half an hour had positive responses from twelve graduate students. Delighted to find such an unexpected lode of interest and civic-mindedness, Loyce set up the seminar. Over the next months she and the students immersed

NSF-AWM TRAVEL GRANTS FOR WOMEN

The objective of the NSF-AWM Travel Grants program is to enable women 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.

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 of NSF, and the research conference must be in an area supported by DMS. For example, this includes certain areas of statistics, but excludes most areas of mathematics education and history of mathematics. Applicants must be women holding a doctorate (or equivalent experience) and having a work address in the U.S. (or home address, in the case of unemployed mathematicians). Anyone who has been awarded an AWM-NSF travel grant in the past two years or who has other sources of external funding, including *any* NSF grant, is ineligible. Partial support from the applicant's institution or from a non-governmental agency does not, however, make the applicant ineligible.

Target dates. There are three award periods per year. An applicant should send *five* copies of 1) a description of her current research and of how the proposed travel would benefit her research program, 2) her curriculum vitae, 3) a budget for the proposed travel, and 4) information about all other sources of travel funding available to the applicant along with *five* copies of her cover letter to: Travel Grant Selection Committee, Association for Women in Mathematics, 4114 Computer & Space Sciences Building, University of Maryland, College Park, MD 20742-2461. If you have questions, contact AWM by phone (301-405-7892) or email (awm@math.umd.edu). Applications via email or fax will not be accepted. The next deadlines for receipt of applications are **October 1, 2000** and **February 1, 2001**.

themselves in the realm of the NCTM *Standards*, the TIMSS results and NSF curricula. They visited class-rooms, talked with teachers and wrote a hefty report strongly recommending one of the choices, while emphasizing throughout that this was just a data point for the use of the teachers, who were the actual decision-makers.

In due course, the decision was made, and the rec-ommended curriculum was selected. But the seminar's study had also netted further information: this particular curriculum has a large mathematical potential, but corre-spondingly presents a large mathematical challenge to teachers as well as students, and teachers faced with that challenge need support. Loyce's response was to ask the teachers if they would like to have graduate students coming to them on a regular basis, and when their reac-tion was highly positive she set out to arrange that. She rounded up financial support from the NSF and the Uni-versity of Washington and professional development support from the University Child Development School, and with that support ten graduate students spent hours each week of the following year in classrooms. The year was highly successful, but could be improved, so Loyce set up a preparatory seminar through the university's Physics Education Group and a more elaborate summer workshop with the UCDS, and sent this year's students out appreciably better prepared.

That's where that conversation has led so far, and it would seem exceedingly rash to predict where else it may lead in the future. One quotation, though, brings us neatly back to where we started. A teacher with whom one of this year's graduate students is working remarked that he loved the mathematics enrichment lessons the

student was tossing in, and he loved having mathemati-cal emergency aid available, but "you know, I think the thing that may have the most impact of all on the kids is the chance to see two adults talking about math — to realize that mathematics is something you can actually have a conversation about."

Conversation — yes!

CBMS Math Ed of Teachers Draft/Request for Help

A new draft of the Report of the CBMS Mathematics Education of Teachers Project is now posted on the CBMS website at www.maa.org/cbms. You will recall that the goal of this project is to produce a document targeted at Departments of Mathematics to help them improve their efforts in the education of future K–12 teachers of mathematics. In short, it is intended to answer the questions: "What do teachers of mathematics need to know and how should they come to know it?"

The writers and the project steering committee are seeking comments and advice from individuals and from formal math society groups such as committees on edu-cation or existing Association Review Groups (ARG's) that were formed to review the NCTM *Standards*.

It would be most helpful if we could receive your comments by **June 1**. We plan to go into publication in September and intend to use the summer for final revi-sions based on the thoughtful comments we hope to receive.

We have posted a series of questions with the docu-ment to help start the discussion, but we welcome com-ments about any aspect of the report. Information about where to respond is also posted on the website.

CALL FOR NOMINATIONS: LOUISE HAY AWARD

The Executive Committee of the Association for Women in Mathematics has established the Louise Hay Award for Contributions to Mathematics Education, to be awarded annually to a woman at the Joint Prize Session at the Joint Mathematics Meetings in January. The purpose of this award is to recognize outstanding achievements in any area of mathematics education, to be interpreted in the broadest possible sense.

The nomination documents should include: a one to three page letter of nomination highlighting the exceptional contributions of the candidate to be recognized, a curriculum vitae of the candidate not to exceed three pages, and three letters supporting the nomination. It is strongly recommended that the letters represent a range of constituents affected by the nominee's work. *Five* complete copies of nomination materials for this award should be sent to: The Hay Award Selection Committee, Association for Women in Mathematics, 4114 Computer & Space Sciences Building, University of Maryland, College Park, MD 20742-2461. Nominations must be received by **October 1, 2000**. For more information, phone (301) 405-7892 or email awm@math.umd.edu. Nominations via email 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 Science Foundation,
and the Association for Women in Mathematics

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

WHEN: The next AWM Workshop to be held in conjunction with the annual Joint Mathematics Meetings will be in New Orleans, Louisiana, January 10–13, 2001 *(pending final funding approval)*. The exact date of the Workshop is not known at this time; most likely it will be Saturday, January 13, 2001 with an introductory dinner and discussion group on either Thursday or Friday evening (1/11 or 1/12).

FORMAT: Twenty women will be selected in advance of the workshop to present their work; the selected graduate students will present posters and the recent Ph.D.'s will give 20-minute talks. AWM will offer funding for travel and two days subsistence for the selected participants. The workshop will also include a panel discussion on issues of career development, a luncheon and a dinner with a discussion period. Participants will have the opportunity to meet with other women mathematicians at all stages of their careers. All mathematicians (female and male) are invited to attend the program. Departments are urged to help graduate students and recent Ph.D.'s who do not receive funding to obtain some institutional support to attend the workshop presentations and the associated meetings.

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

ELIGIBILITY: Applications are welcome from graduate students who have made substantial progress towards their theses and from women who have received their Ph.D.'s within approximately the last five years (whether or not they currently hold a postdoctoral or other academic position.) Women with grants or other sources of support are welcome to apply. All non-U.S. citizens must have a current U.S. address. All applications should include a curriculum vitae, a concise description of research (2–3 pages), and a title of the proposed talk/poster. All applications should also include at least one letter of recommendation; in particular, graduate students should include a letter of recommendation from their thesis advisors. Nominations by other mathematicians (along with the information described above) are also welcome.

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

Workshop Selection Committee
Association for Women in Mathematics
4114 Computer & Space Sciences Building
University of Maryland
College Park, Maryland 20742-2461

Phone: 301-405-7892
Email: awm@math.umd.edu   WWW: www.awm-math.org

APPLICATION DEADLINE: Applications must be received by **September 1, 2000**.
Applications via email or fax will not be accepted.

HOW TO INCREASE THE NUMBER OF TENURED WOMEN IN MATHEMATICS DEPARTMENTS

A year ago while working as an assistant professor at Johns Hopkins I was informed that the dean was creating a task force to increase the number of tenured women and minority professors at Hopkins. At the time, I was the highest ranked woman in the Department of Mathematics, although the separate Department of Mathematical Sciences had an untenured female associate professor. Nevertheless, I couldn't think of any suggestions to make. Thus, I was very pleased to have the opportunity to attend an AWM panel discussion on exactly this topic. I volunteered to write this report and hope it will prove useful to departments and universities wishing to increase the number of tenured women.

The panel "How to increase the number of tenured women in mathematics departments" met on Wednesday at the January Joint Mathematics Meetings in Washington DC and had standing room only attendance. The five panelists were Elaine Hansen, the Provost of Haverford; Maria Klawe, Dean of Science at the University of British Columbia; Peter Sarnak, Professor at Princeton University; Millie Dresselhaus, Institute Professor at MIT; and Karen Uhlenbeck, Professor at the University of Texas at Austin.

Elaine Hansen, the Provost of Haverford, spoke first. Perhaps the most salient point she made was to remind chairmen that they should avoid the "starstruck syndrome":

> While it's true that pipeline issues matter, there are often many candidates that get overlooked under this model, people who are not yet stars, or may never be stars, but are perfectly well-qualified to do the job. It's important for someone to point out this bias, to insist that search committees take a realistic look at the qualifications of those faculty already holding tenured positions and not expect that a woman or scholar of color meet higher standards than other candidates....

She then proceeded to describe how a college could foster the hiring and tenuring of female faculty.

Hansen began with a discussion of Haverford's situation. In 1980, the college had four tenured women, none of whom were in the natural sciences. Since then the college has made a determined effort to attract female faculty with marked success. Once "critical mass" was achieved, more women were then hired and promoted in tenure track positions. Two of the five tenured faculty in the math department today are women.

The college also created Regular Part-Time (RPT) positions for teacher-scholars. These positions have first three year and then six year appointment renewals. Two of these positions were taken by high caliber women, a biologist and a chemist, who wanted flexible work schedules. Currently the only RPT position in the math department is filled by a man.

As a small college Haverford had to do more to entice and encourage female faculty. It offered plenty of support for travel, pretenure leaves, well-publicized policies against sexual harassment and discrimination, fair service assignments, and recognition for teaching well at all levels. All faculty are engaged in extra-departmental affairs, such as collegewide governance and faculty development programs. Networking of women in different departments was facilitated.

In addition to making suggestions for policy changes, Hansen stressed the importance of encouraging female faculty on a more informal level. It is not enough just to have "adequate maternity leave" but it should be "applied fairly and with good will." When arranging meetings, faculty with families should be kept in mind, and it should be noted that 4–6 P.M. may be very inconvenient for those with school-age children. There should be recognition for and understanding that "there's more than one trajectory of excellence."

Finally, she encouraged the senior tenured women in AWM to be supportive of the junior women in their departments. It is important to understand that, as times have changed, a junior woman might make more demands than the senior one did. The younger woman might want a friend and might need to be told who her friends are. It is also a sad truth that committees will often think less of a female candidate for promotion if the only woman on the committee has a negative impression of her.

Hansen closed with a reading from *Small Changes* by Marge Piercy.

Christina Sormani, Lehmann College, CUNY,
sormanic@member.ams.org

Maria Klawe, Dean of Science at the University of British Columbia was the next to speak. She presented the alternate view as a representative of a large university with 40 tenured math faculty. When a student queried the fact that only two of these faculty were women, the department decided to take action. Departments often adjust their searches to find members of a particularly hot research field, to satisfy a local industry, to meet a grant's requirements or even to please a donor. The department does not lower its standards by making such appointments. Similarly, it need not lower its standards to hire a woman.

The UBC math department first made hiring a woman an objective. They then made a list of possible hires at all levels from Ph.D. candidates to senior mathematicians. The entire department was given the task of keeping an eye out for potential applicants. They then collected vitas from these candidates, circulated them and chose five. The dean was presented with these five candidates as potential hires and awarded the math department five lines. At this point the department was able to advertise and conduct a full search. So far one woman has been hired, a second was very likely to accept an offer and a third might be offered a position later this year.

Klawe added that the women they hired specifically asked whether UBC valued "mentoring" and "creating a supportive community." The university also had to work very hard to get spousal appointments.

Peter Sarnak then described a similar method used by Princeton University to increase the number of tenured women in the math department from zero to two. Although his department has tenure-track faculty, very few pass the tenure review. Primarily, Princeton hires well-known senior mathematicians and tenures them immediately. The department has committees assigned to keep an eye out for potential hires in desired fields. Five years ago, they set up a committee to find a woman to fill a senior-level position.

Sarnak emphasized that the university administration encouraged such searches by allowing departments to compete for lines by proposing potential female or minority candidates. The math department never won such a line, but the women they selected were of such high caliber that they tried to hire them anyway. He emphasized that the two women hired by the math department were always considered their equals and that

the department did not in any way compromise its standards to hire them.

Millie Dresselhaus, Institute Professor at MIT, then spoke. She first discussed the MIT Report and how it was leaked to the New York *Times*, causing the university to take action. Although the report was focused on the unequal treatment of tenured female faculty, since its release, the number of tenured women at MIT has increased from 22 to 31.

As a physicist, Millie Dresselhaus reported on action taken by the American Physical Society to improve the status of women in physics. In 1990, the APS noticed that there were not enough Ph.D.'s in physics to fill the positions available in physics departments around the country. They decided to increase the number of physics Ph.D.'s by encouraging more women to complete the degree. This led to the creation of "Improving the Climate for Women in Physics Site Visits" funded by the National Science Foundation. In this program, teams of women physicists visit departments that volunteer to be assessed. For an in-depth description of this program and its successes, see the website http://www.aps.org/educ/cswp/sitevisit.shml#site.

Dresselhaus emphasized that 50% of the site visits led to the appointment of a female faculty member and that the number of women faculty in physics has doubled since 1990. She recommended that similar site visits be organized to study how to improve the climate for female faculty in mathematics. The audience was highly supportive of this idea, and some people suggested conducting internal reviews of a similar nature. However, Professor Dresselhaus stressed the importance of a review by unaffiliated women mathematicians.

Karen Unhlenbeck of, the University of Texas at Austin was the last panelist to speak. She emphasized that three of the five tenured female faculty members in her department were hired as tenured faculty. These three were already tenured at research departments before they were hired, and each was hired as half of a couple. While one member of a couple was usually a great researcher, the other was usually great for the department.

She stressed the fact that 45% of the adjuncts in her department were female. In fact, for a period of many years, only one woman was interviewed for a junior tenure-track position in pure mathematics. She felt that her

department wasn't willing to try to judge junior women. The department was too traditional in its hiring and had a definite lack of imagination. In fact the university had a poor policy on sexual harassment and no policy whatsoever on gender harassment.

On the other hand, her department has been fairly successful hiring senior women because of a number of positive attributes. There is a female dean, an active women's group on campus, and a women in science course. In fact the university was coed since it was founded. It also had a famous woman physicist, Cecille deWitt-Morette, on the faculty when Uhlenbeck was hired. The fact that deWitt-Morette worked at the university contributed to Uhlenbeck's decision to take the position at Texas. Once women started to appear as faculty, the number of women both in faculty positions and in graduate programs kept growing. This reinforced Hansen's idea that a "critical mass" of women needs to be achieved to attract more women.

Unlenbeck closed by posting a diagram describing the straight and narrow path leading towards becoming a tenured senior mathematics professor and the many exits from this career path. A United States undergraduate in mathematics must decide to go for a doctorate in mathematics and not in some equally exciting field in science or engineering. She must do "research in a narrow field" and then become a "toe the line" assistant professor before becoming a tenured senior faculty member, "free to pursue her personal interests." At any point in this process she may be tempted away by family, nonacademic research, and teaching jobs, all of which are "rewarding life choices." Furthermore, despite all these paths away from the academic research position, there are few if any paths back.

One audience member noted that in 1991, 59 women graduated from Group I institutions but only 15 were hired at group one institutions. Some 44 women who might have been tenured in research positions today had missed the first step in Uhlenbeck's diagram. Would there be any way to find these women and see where they are today? Susan Landau's study of MIT graduates was cited as a possible place to look for more information.

Other audience members suggested forming a databank of women in math so that it would be easier to find potential candidates that had not travelled the straight and narrow path. Such a databank of Canadian women in mathematics exists and another of women in physics. Sarnak noted that, in fact, one of the two women hired at Princeton was hired from AT&T Bell Labs and not from an academic institution. Finally, it was noted that there are POWRE grants funded by the NSF to encourage women in science to get their research careers back on track. Perhaps a department could look for women and encourage then to apply to use a POWRE grant in their department. They could then hire these women in tenure-track lines once their research had been revived.

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. She must either be a U.S. citizen or have a school address in the U.S. The eleventh annual Schafer Prize will be awarded at the Joint Prize Session at the Joint Mathematics Meetings in New Orleans, Louisiana, January 10–13, 2001.

The letter of nomination should include, but is not limited to, an evaluation of the nominee on the following criteria: quality of performance in 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, 4114 Computer & Space Sciences Building, University of Maryland, College Park, MD 20742-2461. Nominations must be received by **October 1, 2000**. If you have questions, phone 301-405-7892 or email awm@math.umd.edu. Nominations via email or fax will not be accepted.

I felt that the panel was a great success in promoting novel techniques for improving the number of tenured female faculty in any scientific field. Departments who wanted to hire women were capable of doing so when committees were formed and careful thought was given to inviting women to apply. Departments who wanted to attract and promote more women were able to do so by improving the quality of life for women on their campuses, through networking, appreciation of teaching, leaves of absence for maternity and research, and support for travel. If a review board similar to the I.C.W.P. Site Visits program were created by AMS/AWM, perhaps even more departments would come up with solutions particular to their needs. If a databank of women in math were created it would be easier for departments interested in hiring women to find women who might not have traveled the traditional academic path. Finally universities could encourage an increase in tenured female faculty by allowing departments to compete for lines, creating new kinds of lines, providing for spousal appointments and organizing interdepartmental networking for women.

Please feel free to post ideas and comments on the AWM Forum Webpage by entering http://www.casualforums.com/ siliconvalley/awm and selecting "Tenured Women."

NEBRASKA CONFERENCE FOR UNDERGRADUATE WOMEN IN MATHEMATICS

The second Nebraska Conference for Undergraduate Women in Mathematics was held February 11–13, 2000 at the University of Nebraska – Lincoln. The aim of the conference was to give women the opportunity to discuss their undergraduate research projects and to meet other women who share their interest in the mathematical sciences. Approximately 70 undergraduate women participated, 35 of whom gave talks on their own research. The student speakers came from as far away as University College Cork in Ireland and the University of Puerto Rico – Humacao. Professors Suzanne Lenhart

Lisa Orlandi-Korner, University of Nebraska

from the University of Tennessee and Karen Uhlenbeck from the University of Texas gave invited addresses, and there were two panel discussions. The conference was organized by UNL professors Allan Donsig, Susan Hermiller, Lisa Orlandi-Korner, Richard Rebarber, and Judy Walker, and UNL students Julie Berg and Jaclyn Kohles. Funding was provided by UNL's Math/Science Education Area of Strength, a UNL Diversity Enhancement Grant, and the UNL Department of Mathematics and Statistics, as well as by a grant received as part of the Department's 1998 Presidential Award For Excellence in Science, Mathematics & Engineering Mentoring.

This year's conference was a great success. The invited lectures were fascinating, and the undergraduate women participants were thrilled to meet such prominent mathematicians as Professors Lenhart and Uhlenbeck. The panel discussions on deciding whether to attend graduate school and choosing a graduate school were dynamic and thought-provoking. The talks by undergraduate women were impressive and inspiring, and the participants enjoyed meeting each other during the banquet and other social breaks. Several of the participants who had not yet had the opportunity to do research commented that they hoped to give talks at next year's event.

FULBRIGHT PROGRAM

The Fulbright Scholar Program's annual competition for lecturing and research grants in about 130 countries has opened. Opportunities are open not only to college and university faculty and administrators, but also to professionals from the business community and government, as well as to artists, journalists, lawyers, independent scholars and many others. Grants are available to faculty and administrators from two-year, four-year, and graduate institutions. Fulbright awards vary from two months to an academic year or longer. About 80 percent of the awards are for lecturing; foreign language skills are required in some countries. Application deadlines are **August 1, 2000** for Fulbright lecturing and research grants and **November 1, 2000** for spring/summer seminars for international educations and academic administrators. For more information, see the web page www.cies.org.

AWM SCHOLARS REPORT ON AAAS SPECIAL SESSIONS

The Reasonable Effectiveness of Mathematics: Mathematics in Hollywood, Industry, and Daily Life

In 1921, Albert Einstein mused, "How can it be that mathematics is so admirably appropriate to the objects of reality?" This tight relationship between mathematics and many aspects of daily life was explored in a pair of seminars co-organized by Lenore Blum (Carnegie Mellon University) and Felix Browder (Rutgers University).

The well-attended morning session, subtitled "Mathematics in Hollywood, Industry, and Daily Life," perhaps may credit some of its popularity to the glamour and intrigue promised by the title. However, listeners were first treated to a talk by Phillip A. Griffiths (IAS), who provided "Some Thoughts on Mathematical and Scientific Research." Chiefly, Griffiths introduced the idea that science and mathematics will become more interconnected in the coming century. He outlined three trends to support his thesis: the interconnectedness of research activities (applied research may lead to advances in pure science, while the ideas from "basic" research are integral to applied experimentation), the shift from simplicity to complexity in research (rather than reducing science to basic laws, we now look to complexities to model a complex world), and the persistent increase in interdisciplinary research.

Tony DeRose of Pixar Animation Studios demonstrated where interdisciplinary applications of mathematics may lead with a video of "Geri's Game," a Pixar short film. The film was Pixar's experiment with subdivisional surfaces, a mathematical compromise between the B-splines and faceted models previously used in computer animation. These surfaces, while just as efficient as B-splines, allow for the more realistic skin and cloth movements necessary for portraying human characters via computer animation. The improvements may be observed in the studio's latest release, "Toy Story 2"; the new method worked so well that all the characters were rebuilt with these principles in mind.

The next talk was "Soft Mathematics: Taking Mathematics into the Social World." Keith Devlin (St. Mary's College of California) advanced the theory that

mathematics as "the science of patterns and abstract structure" pervades the social sciences. This vision of the mathematical method in the social world involves identifying a type of pattern, abstracting it from its context, and studying it in a formal fashion, as has been done by linguists such as Chomsky and Grice. These instances of "soft mathematics" have served to reduce complex ideas to systems of axioms, improving understanding while accepting that definite answers may not be obtainable. Bayesian inference also plays a major role in soft mathematics. This "mathematics atop common sense," as the speaker termed it, can be found in such diverse arenas as DNA evidence, the Microsoft Office "paperclip" and NMR spectrum data.

Though mathematical reasoning pervades the social sciences, the public is often last to accept mathematical explanations. Nevertheless, math can be a very important tool for the journalist; as K. C. Cole of the LA *Times* noted in her talk ("Confessions of a Math Mole in a Major Metropolitan Newspaper"), "Math allows you to find out what is true" in the face of "messy information." Her articles often tackle "hot" or pressing topics in mathematics and physics (string theory is a favorite); though she attributes their publication to her "being sneaky" with her editors, favorable reader response to such varied mathematical topics as Arrow's impossibility theorem, complexity and "flimsy excuses" (regarding the Unabomber), and the mathematics of prediction assure that the LA *Times* will remain uniquely open to news stories about mathematics. Also popular are stories about mathematicians in Cole's "Scientists on the Edge" series, which gets math in the news by focusing on people, including mathematicians behind the scenes in Hollywood and amateur mathematicians à la Good Will Hunting.

The Reasonable Effectiveness of Mathematics: Algorithms and Complexity, Paradigms of the 21st Century

The focus of the lectures shifted to a more technical side in the afternoon session. This session (also organized by Lenore Blum and Felix Browder) included four

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Andrea Frazier, senior major in mathematics and English at Illinois College, and Diana Sepehri, sophomore major in mathematics and biology at Bates College

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Diana Sepehri and Andrea Frazier

intriguing lectures linked together under the subtitle "Algorithms and Complexity: Paradigms of the 21st Century." Unlike the morning session, this title wasn't catchy and glamorous. In spite of this, the session was generally well attended. Steve Smale, Mathematics Professor at City University of Hong Kong, started the session with his talk "Limits of Intelligence" and devoted most of it to Learning Theory and its mathematical foundation. He effectively challenged the binary notion of data and patterns given by Turing Models/computers, proposing the use of approximate "real" models with approximate input and output as opposed to the current binary models that function with exact inputs and outputs only.

Jennifer Chayes, however, astonished us all with her talk concerning "Phase Transitions and Scaling in Computer Science" which stemmed from her expertise as a director of Microsoft Research. She posed the question "How do we solve problems in increasingly large systems?" and after examining various models she concluded that, contrary to common belief, we can never hope to solve large-scale problems completely. However, we can classify typical solutions.

Next, Bernard Sturmfels (UC Berkeley) discussed integrating the main ideas of algorithms and complexity through the study of algebraic varieties, which are solution sets of polynomial equations. Via an example of a specific system of polynomials which appears to have the "wrong" number of solutions, he showed that by using Newton polytopes as in Bernstein's Theorem (1977) we can understand the number of solutions. He further concluded that "all of (pure) math can be applied (computational and experimental) math," which seems to be one of the main paradigms for 21st century mathematics.

The final speaker was Peter Shor, who is responsible for most of the quantum computing lab research at AT&T. In many ways he presented a more specialized follow up on Steve Smale's proposal for a "real" computing model. Having quantum physics and mathematical topics such as factoring and periodicity in mind, he devoted his time to explaining what things quantum computations are good for. He also touched upon some math misconceptions of quantum computations. These include: 1) they always give a faster version of a classic computation; 2) they work for all problems.

Even though building such a computer would require scientists to overcome many difficulties such as error

correction and degree of fault tolerance, Peter Shor believes that achieving this goal is possible. After all, he asserts, achieving the seemingly impossible is the main paradigm of the 21st century!

Mathematics of Politics

At first it did not seem perfectly clear; the concepts of mathematics and politics correlated into one topic? Yet, the AAAS symposium organized by Leon H. Seitelman (University of Connecticut) blended the political issues of census, representation, and voting with mathematics. Approximately 30 participants listened to and discussed these concepts with five informative speakers.

First the symposium focused on the issues of redistricting. In his talk, "Washington: A Base 10 Town," the symposium organizer Leon Seitelman discussed the current trends in assigning seats and drawing district lines according to the views of a mathematician and a politician. That is, from a mathematical sense districts' shapes and sizes should be controlled by compactness, optimization, and ratio control. However, politicians tend to draw district lines to improve the electability of party candidates. A "modest proposal" to the one-man one-vote implementation should minimize maximum differences (the ratio of citizen per representative).

The second presenter was David Freedman (University of California, Berkeley) who enlightened the audience with a statistical approach to the United States Census ("Statistical Controversies in Census 2000"). Topics included counting methods such as capture-recapture, division of counting blocks, and estimating an undercount. The census is a multi-step process which employs a variety of statistical methods to get the most accurate count of the U.S. population. The Post Enumeration Survey and Evaluation Follow Up methods for readjusting for an undercount (people not included in the initial survey and "door-to-door" count) or double count (people counted multiple times due to move, etc.) were discussed. An accurate count is needed for selecting district size and number of representatives.

In the next presentation, David Houseman (Goshen College) described methods of the "mathematics of

Minde Bolz, senior math major at Eastern Michigan University, and Jennifer Kosiak, doctoral student in mathematics education at Montana State University

Congressional apportionment." He spoke about the history of methods developed by previous pioneers such as Hamilton, Jefferson, Hill, and Webster. The latter three considered how to select a Congressional size and then choose a method of truncation or rounding of the number of seats per district. Additionally, Houseman outlined desirable properties in these methods for rounding including "near fair share" (the transfer of a seat should not simultaneously take both states closer to a quotient) and "partial population monotonicity" (any state with a relative increase in population should not lose a seat to a state with a relative decrease in population).

The latter half of the symposia was allocated to procedural methods in the election of officials. In his talk, "Are There Better Procedures to Nominate and Elect a President?" Steven J. Brams (New York University) remarked on and gave solutions to three practical problems. The first involved the "momentum effect" in which states that hold early primaries (such as New Hampshire) tend to have a greater effect in the nomination for a party candidate than those states who have later primaries. Brams suggested that this flaw could be eliminated by discounting delegate votes in states that hold early primaries to create equilibrium in the selection process among all states. The second problem dealt with the Electoral College's "win all" mandate. Tied to cooperative gaming theoretics, candidates tend to spend more money in states with larger numbers of electoral votes. It was suggested to abolish this electoral procedure and replace it by a "direct popular-vote election." The final practical election reform introduced "approval voting" in a multi-candidate election. In this method, voters would have the opportunity to vote for as many of the candidates as they liked. It is believed that such a reform election process would select the strongest candidate overall and eliminate the wasted-vote phenomenon. Two prominent mathematical associations (MAA and AMS) have implemented this type of election.

Apparently opposed to approval voting, the final speaker addressed various paradoxes in voting methods. Daniel Saari (Northwestern University) explained the effects of procedural choice on the outcome of elections. It was estimated that in 70% of our nation's elections the choice of procedure alters voting results. Saari stressed that approval voting could result in many different outcomes. His solution was to use the Borda Count which is a ranking system of voting. For example, in a four candidate election, a voter's top choice would receive three

points, the next choice would get two points and so on. This ranked system was viewed to minimize discrepancies in the outcome.

Overall, the symposium explored many of the mathematical issues underlying American politics. The speakers effectively meshed the two concepts in a wonderful presentation that evaluated the topics of the census and the election process. All of which did indeed involve numbers, modeling, and a mathematical outlook.

Predicting More, Assuming Less: A Game-theoretic Approach to Inductive Inference

The mathematics of statistics is the basis for the analysis of many aspects of science such as prediction of gene function, universal investment, and economic markets. The Saturday afternoon symposium titled "Predicting More, Assuming Less: A Game-theoretic Approach to Inductive Inference," attended by approximately thirty individuals, explored three approaches toward statistics. The speakers each gave thorough examples of classical/traditional, direct and on-line approaches to statistical analysis. The organizer and first speaker, Dr. Yoav Freund of AT&T Labs – Research, focused mainly on the definition of the aforementioned approaches. According to him, both online and direct approaches which proceed directly from data to a prediction are more accurate for unknown complex functions than the traditional approach which first involves constructing a model.

Our second speaker, David Haussler from UC Santa Cruz, demonstrated the application of direct modeling in predictions of gene function from the available genomic data. He mentioned the protein-coding gene in DNA, finding new proteins, and initial classification and analysis of protein sequence to be some of the immediate computational challenges facing mathematical biology in the 21st century. One way to deal with these challenges is the further use of hidden Markov models and support vector machines on data produced by genechips. Such studies will be particularly helpful with the expected completion of the human genome project in the summer of 2000.

The third part of the symposium was given by Mr.

Diana S. Sepehri and Karen Almgren, senior major in math and physics at MIT

Thomas Cover from Stanford University. His talk focused on universal data compression and universal portfolios which deal with ways of organizing one's investments in an ideal way, hoping to make the audience extremely rich over the next 22 years!

Professor Rakesh Vohra of Northwestern University presented the interactivity of prediction and outcome in game theoretic models. Proceeding from the analysis of simple games such as "paper, scissor, rock" and "prisoner's dilemma" he stated that human decision making does not follow a hyper-rational strategy but rather a "no regret" policy. Foster and Vohra's "no regret" theory applies when no one choice is always preferable to the one already chosen (i.e., players play to avoid regret). Toward the end of the lecture he introduced the notion of correlation device and claimed that past history is our correlation device for examining human behavior and developing methods and mathematical formulas concerning our decision making patterns.

Battling the Crypto Wars

Organizer Susan Landau opened the symposium with a brief overview of the history of cryptography. The thirty people attending the session were privileged to hear the views of four invited speakers: a government employee, a lawyer specializing in first amendment rights, a specialist in international cryptography policy, and the co-developer of the public key system. Together, they explored the many facets of the regulations, both domestic and international, dealing with cryptography.

Susan Landau, of Sun Microsystems, Inc. explained how the use of encryption in America has evolved from its early use in the simple codes published in George Fisher's 1748 text on "codes and ciphers" into a requirement of electronic commerce and a worldwide communications network. The speakers were called upon to address three specific questions: Is there an absolute right to communications privacy? Is widespread use of cryptography a problem or perhaps a solution? What constitutes success of government policies?

First to address these issues was Bruce McConnell from the Executive Office of the President. He pointed out how cryptography policy has been complicated by

Karen Almgren and Grisha Stewart, doctoral student in number theory at Bryn Mawr

numerous stakeholders with competing interests. He stated that the administration's goal is to achieve a balance between securing e-commerce and protecting privacy, national security, U.S. industrial global leadership in information technology, and public safety. The responsibility for regulation of cryptography has passed from the State Department's Munitions list to its current position in the Department of Commerce, due in large part to rapid evolution of the Internet into a marketplace.

For a different perspective, the next speaker was Cindy Cohn, of McGlashan and Sarrall, P.C., a lawyer advocating the deregulation of the distribution of cryptographic source code. Currently, hard copies of cryptographic code can be exported, while transmission of cryptographic code on disk or via the Internet without approval may be considered a criminal offense. Regulation of non-classified science can inhibit the free exchange of ideas, both for peer review and for educational purposes, making this issue pertinent in academia as well as commerce.

Deborah Hurley of Harvard University was the symposium's fourth speaker. She addressed the responses of foreign governments to the security and privacy issues involved in cryptography. In her opinion, there are two important considerations for human interaction: a need to communicate and a desire to limit the audience. Many countries have fewer restrictions on transmissions of cryptography. The U.S. has often placed more emphasis on security issues. Other countries, however, often feel that the benefits of widespread distribution of the technology in reducing cyber-crime outweigh the security risks. Hurley stated that while there is no absolute right to communications privacy, the use of cryptography is beneficial to society. The widespread use of cryptography to encourage secure e-commerce, as well as to allow freedom of expression and protect human rights, should be the goal of government policy.

Our final speaker, Whit Diffie of Sun Microsystems, Inc., addressed the intrinsically limited role of cryptography in security. While there are certainly breaches in security in the computer systems, the main concern lies in the human components. He gave a variety of examples in which technology properly kept personal data secure, yet the employees of the receiving firms used the data inappropriately, failing to protect the privacy of the individuals who had submitted the information. An important issue for Diffie was verification of user identity. In his own words, "Authentication is always more

important than confidentiality," and can effectively discourage fraud. While not always an issue, it is currently far more difficult to verify the source of a message than to take on a false address.

Although the panel members disagreed on several counts, they had a meaningful discussion of the many complex issues involved in the governmental policies on cryptography. The ambiguities of the current government policy make it difficult for cryptographers and small businesses to communicate with their colleagues and even to establish exactly what the laws permit. In the view of most of the panelists, it would be ideal if everyone could be made aware of the security options and responsibilities of being online in the Information Age.

Shaping the Future Learning of Mathematics and Science

The 1998 report "Unlocking Our Future: Toward a New National Science Policy" lauded accelerated accrediting programs for math and science teachers, but never provided evidence that such programs were effective, and never acknowledged that such evidence was necessary! Such unsubstantiated reports stand in for verifiable data in many treatises on science and mathematics education. The symposium "Shaping the Future Learning of Mathematics and Science," organized by Judith Sawder (San Diego State University), attempted to define the role of research in the next century's investigations of mathematics and science learning.

In the first talk, "The Reasonable Role for Research in Setting Educational Policy," James Hiebert (University of Delaware) discussed the appropriate roles for research in educational decision making. At the heart of his presentation were two lists: what research cannot do (set policy, determine standards, or prove the best course of action) versus what research is capable of (document the current situation and the effectiveness of new ideas). Following up on these ideas was Jeremy Kilpatrick of the University of Georgia, whose discourse on "Research Synthesis as a Political Enterprise" examined the research-based knowledge in math education as currently synthesized by the NCTM's *Principles and Standards for School Mathematics* and the National Research

Council's *Mathematics Learning Study*. He emphasized the need to recognize the role of the teacher in a research project: "Teachers are treated like constants, when in fact they are variables in our research."

Thomas Carpenter (University of Wisconsin-Madison) applied these theories of research to his own work in algebraic thinking at the elementary level. According to Carpenter, an important part of "Fostering the Development of Students' Mathematical Thinking in Classrooms" is sustained discussion, for example, using open number sentences and true and false expressions to explore the meaning of equality.

After a spirited discussion on the questions of mathematics research, Kathleen Fisher of San Diego State University introduced cartographic development, a way to present "large volumes of data in ways that are visually interesting and comprehensible." Her joint work with James Wardersee (LSU), "Enhancing Cognitive Skills for Meaningful Understanding of Domain-Specific Knowledge," explored knowledge mapping as a constructivist-learning tool and as a road map to knowledge and wisdom. The talk included a demonstration of SemNet software, which allows students to create these maps.

Marcia Linn (UC Berkeley) cites the need to change the overwhelming width of American science curricula. In "Science Instruction: Designed, Not Decreed," she presented a method of efficient information delivery, which involved providing a web-based forum for interaction between students, teachers, and scientists where, for example, scientific concepts like the spread and control of malaria may be discussed in depth.

To close the session, Frank Lester (Indiana University, Bloomington) traced "The Emergence of a Professional Community of Mathematics Education Researchers." Lester sees mathematics education research emerging from a past of solitary research, based on behavioral psychology and searching for quantitative results. By the 1970's, he finds, this research turned away from behaviorism and became more collaborative, taking cues from developmental psychology. By the late 1980's, research communities began to emerge, creating today's community with its needs for a language shared with math teachers, standards of quality, responsive (instead of reactive) research agendas and solidarity of purpose. As we shape the future of mathematics education research, Lester argued, we need to address the questions of what to research, what that research will

Andrea Frazier and Jennifer Kosiak

accomplish, who we wish to inform about our results, and how to determine the scientific character of the inquiries in mathematics education research.

Earth, Sky, and Sea: Mathematical Modeling in the Earth Sciences

The Sunday morning symposium "Earth, Sky, and Sea: Mathematical Modeling in the Earth Sciences" was organized by Barbara Keyfitz (University of Houston and Brown University) and Richard Somerville (Scripps Institute of Oceanography, University of California, San Diego). Five speakers presented information about the earth's magnetic field, circulation in the ocean, the hydrologic cycle, El Niño events, and earthquakes.

Gary Glatzmaier (University of California, Santa Cruz) began this session with a talk entitled "Earth: Numerical Simulations of the Geodynamo." Through a series of slides and computer generated video images, he demonstrated how the dipole polarity of the earth's magnetic field changes. Historical evidence of changing dipole polarity can be found in ocean bottom core samples and lava flow.

"The Ocean Circulation as a Stabilizer and De-stabilizer of Climate" was a presentation given by Rainer Bleck (Los Alamos National Lab). He related the flow of water in ocean basins to a conveyor belt that moves warm water near the surface and causes cold water to move at the ocean's bottom. Two major contributors to this rearranging of the ocean are the wind and thermally driven buoyancy forces such as rain and evaporation.

David Randall divided his presentation titled "Numerical Simulation of the Atmospheric Hydrological Cycles" into two sections: definitions and description of the challenges we face when it comes to working with water and strategies for mathematical modeling of hydrological cycles. All three states of water are complicated to describe. For example, he mentioned that water in its liquid state is "lumpy" and the process which combines small amounts of water together is not quite as simple as it seems. Furthermore, clouds are known to be very turbulent with badly behaved interior motion. But of course water is essential to life, so modeling its activities in the hydrological cycle is of great importance. Professor Randall mentioned two different

methods currently used for such modeling: the Eulerian framework (latitude/longitude model) and the spectral method. He concluded his talk by saying that most people who are working in this field don't exactly understand what they're doing and where they're heading since there is a lack of mathematical methods and computer technology to simulate the hydrological cycles realistically.

The famous "El Niño" was the topic of our fourth speaker, Antonio Busalacchi. His talk mainly focused on what El Niño is and what is being done today regarding this natural disaster. Unfortunately, as interesting as his subject matter and the presentation was, there was little discussion of the mathematical modeling of El Niño and its challenges. He mentioned that there are many flaws within the current models, but no detail followed!

The final speaker, Paul Robert (University of California, Los Angeles), gave a talk entitled "Some Things Earthquakes Tell Us." Some of the underlying mathematics in earthquake predictions was revealed. First, the types of earthquakes can give a P-wave, S-wave, or surface wave; the first is a longitudinal wave and the others are transverse or sinusoidal waves. Predictions can be made using the variational property of least time by minimizing a path integral.

Overall, this symposium was very interesting and well-illustrated with colorful pictures and creative videoclips. However, it was a bit disappointing that mathematical modeling was not at all the main focus. An overview of the mathematics behind the modeling of different systems for each talk would have greatly enhanced the symposium.

Six Degrees of Separation: From Small-World Networks to the Web

Have you ever wondered how you and Kevin Bacon are connected? This "game" is a type of small-world phenomenon of large interconnected systems. This session organized by Seven Strogatz (Cornell University) explored the linkages that can be formed in these networks and human societies. As onlookers, we wondered if we were somehow mutually connected to the people on our left or on our right.

In his talk regarding the dynamics of "Small World

Minde Bolz and Diana Sepehri

Karen Almgren and Jennifer Kosiak

Networks," the first speaker, Duncan Watts (Santa Fe Institute and MIT Sloan School of Management) discussed the probability that two randomly chosen people could be connected to each other in a specific number of steps or links. This has often been referred to as the Six Degrees of Separation. In the middle ground between highly ordered and disordered systems it was noted that these networks are often highly clustered. In these small world networks, the length of the average connection decreases rapidly, while the clustering coefficient remains high. There turn out to be many real world examples, such as movie stars who have worked together (the Kevin Bacon Game) or the Erdös number, in which mathematicians label themselves as one if they have collaborated with Erdös, two if they have collaborated with someone who collaborated with him, and so on. Human society in general follows a small world model with an average of only about six degrees of separation. However, while this makes you more connected, it also makes it far easier for diseases to spread, yet it is still difficult actually to find a specific person.

The second speaker was Gil Strang (MIT) who discussed certain mathematical concepts of small world networks in terms of a tree structure rather than a cycle. Given a finite number of points, it is possible to create the adjacency matrix, in which any pair that is linked receives a one, and all others receive zeros. One then attempts to find the eigenvalues. Another interesting case is a simple cycle with n nodes to which an extra link is randomly added. Originally, the maximum distance is n/2 (the diameter of the circle) and the average distance is n/4. Adding one random link does not change the maximum distance at all, but the average distance is reduced from 6n/24 to 5n/24. In general, the average distance can be written as the product of the total number of points and a function of the number of shortcuts. For a large number of points and shortcuts, this will generally give a limit of six for the maximum number of steps between any two points.

The third speaker was Harrison White (Columbia University), who brought the theoretical model of networks that the others had been using into the context of the actual behavior of societies. He suggested that at the center of small world networks are "publics," with random ties as a type of social tie. These connections range from the subjective model of strength depending on degree of acquaintance to strength depending on the number of shared acquaintances. Modern society has

many random linkages within its networks, especially when one includes the linkage "stranger" as a weaker tie than "distant acquaintance." The notion of stranger aids in describing certain behaviors in social situations when several strangers are brought together to develop a temporary sense of community.

Bernardo Huberman (Xerox Palo Alto Research Center), the final speaker of the session, used network models to describe the "Laws of the Web." At an estimated eight hundred million web pages and growing, the Internet can be seen as a wonderful source of data for the study of human communities or networks. The average number of web clicks per session (about 1.5) follows an asymmetric distribution, with many people clicking only once or twice but a very long tail in which people may click on hundreds of sites at one sitting. When people surf, they are attempting to maximize their return. In this model eventually the cost (time, money, boredom, etc.) of continuing is greater than the expected benefit of continuing. The benefit of a new webpage remains mostly unknown until visited, but it is usually expected to be closely related to that of the webpage originally visited. Eventually, the value of continuing falls below a threshold and the surfing will cease, similar to real option behavior in economics. Surfing on the Internet leads to social dilemmas, in which a group must cooperate to produce a common good. This is the situation when many people surf the Internet for as long as they wish, yet complain of connections that may take long periods of time. The Internet can be effectively used to find things, but only if the network connections are usable.

These talks illustrated several situations in which networks can model real-world situations. It was apparent that the world is becoming more connected every day, leading to small-world benefits and small-world problems. The network models may help us to better understand how to make the most effective use of the structures available in the real world.

Symmetry and Hierarchy in Art and Science

Arthur L. Loeb's Monday morning session proved particularly inspiring for the AWM Scholars: four women spoke on "Symmetry and Hierarchy in Art and Science." Judging from the size of the audience, many

Minde Bolz and Andrea Frazier

other conference attendees were eager to explore the connections between art and science.

The session opened with an explicit comparison of the artistic and scientific processes, "The Creative Process in Art and Science: Self-Similar or Dissimilar." Metallurgist-turned-artist, Mirlille Clapp (Boston, MA) compared her development as a scientist to her development as an artist, noting the astonishing similarities at each step. For instance, the refinement of hypothesis in a scientific experiment mirrors the adaptations of various techniques used in creating a work of art.

Doris Schattschneider (Moravian College) moved to a more mathematical assessment of symmetry in artwork, using her extensive knowledge of Escher, Rice and others who work on tilings to discuss "Local and Global Symmetry: Escher and the Crystallographers." Her talk, which deserves the whimsical subtitle, "Escher, Meet the Mathematicians!" examined whether the symmetry of a single tile must relate to a patch of a monohedral tiling or, indeed, to the tiling as a whole. Escher's tilings accompanied the mathematical work on the

questions of local and global symmetries, providing crucial counterexamples as well as illustrations.

Symmetry-breaking figured prominently in the discussion "Hierarchies of Symmetry by Choice: Pattern Formation in Oriental Carpets," by Carol Bier (The Textile Museum, Washington, DC). Oriental carpets possess multiple patterns, usually in the form of a central field pattern bounded by a linear pattern; frequently, these patterns are modified by a transformation of color, shape, space or pattern to achieve a particular symbolic meaning.

Finally, Dorothy K. Washburn (Maryland Institute) led the audience in "Exploring the Interface Between Perceptual Processing of and Cultural Preferences for Symmetry." Her work explores the relationships between a culture's preferred symmetry classes and its core values. Washburn introduced the example of Hopi designs, based on bifold rotations, which reflect the cultural perception of marriage as an interlocking of man and woman. Similarly, Western cultures preference for black-and-white, polar differentiation is expressed in our

Back row: Gisha Stewart, Karen Almgren, Jennifer Kosiak, Minde Bolz, Jean Taylor; Front row: Andrea Frazier, Diana Sepheri

affinity for reflections about lines. Washburn argues that these symmetries serve as a grammar for a little-recognized mode of visual communication.

The session finished with a lively discussion of this fascinating interplay between art and science. The audience offered several new perspectives on the material. Unfortunately, as organizer Loeb noted, "our time is limited, our subjects are infinite," and the session was forced to end before the discussion came to a close.

Breaking Barriers: Research, Education and the Web

The World Wide Web and other computer manipulatives are improving accessibility options and mathematical notation sent via the Internet. Past and recent developments have made the breadth of information more available to all users. These and other topics were addressed in the AAAS symposium "Breaking Barriers: Research, Education and the Web."

The first presenter and organizer, Robby Robson (Oregon State University), evaluated the "exchange of education and research on the web." He introduced topics such as MathML, on-line learning, and web standards in a promise versus progress outline. For example, the promise to fulfill a need for mathematical notation on the web to be "live and good looking" has led the way for the progress of MathML. This is a language that is device independent and extendible. Another area of progress is online learning that has been initiated in accordance with the promise for more "collaborative spaces" to incorporate the "wealth of (not necessarily useful) information in order to revolutionize education." As an example of online learning, the Learning Management System acts as a virtual classroom that has the potential to deliver content material to students. The final promise pertained to the idea of implementing an inter-operable (content to be used by others) and reusable component to the World Wide Web. This grand vision has progressed to the introduction of standards such as meta-data (data about data) and personal profiling.

The next presenter was David Smith of Duke University. In his talk he discussed the content of education via "Online Interactive Mathematics Material." Beginning with the joint initiative, Project Calc (Calculus as a Laboratory Course), the call for calculus reform has paved the road for technological development in the terms of course content. From the outset in 1988 to current efforts these developments have focused on realistic problems which engage students actively. Often referred to as Guided Discovery Learning, materials include computer labs, graphing calculators, hyperlinks and downloadable CAS files. They encourage students to work in groups, allow flexibility in course organization, and are often viewed by students as an integral component of the course. These materials are "free and available now." For more information, he directed Web users to his site at http://www.math.duke.edu/education/ccp.

John Gardner of Oregon State University spoke on issues of accessibility. He demonstrated some amazing technologies that his team and others have developed to assist visually impaired and/or dyslexic users. The Tiger printer that his team developed, for example, prints images in raised bumps and text in Braille. The printer is an excellent way of making the Internet a useful resource. Unfortunately, it has difficulty with fonts that are not standard, and web developers should take this into consideration when they write their pages. The "Feel It" mouse from Logitech helps to make the computer appeal to other senses. It physically pulls the user's hand to icons on the screen, or to other preset locations. Because of its mass-market appeal for video games, the device only costs $99, as opposed to the great expense of most accessibility technology.

Professor Gardner also showed the audience *Triangle*, a program developed to give blind students a device similar to the graphing calculator. It is the second generation of audio graphing calculators developed by his group. It is self-vocalizing, which allows the user to hear the mathematics read in mathematical terms, not just as symbols. This means that the user does not have to puzzle out the screen-reading program's phrase, "x star y up arrow 2," but rather hears the words more as mathematicians might say it. The main ingenuity, however, lies in the actual graph. It shows that the symbols and visual images of mathematics that we use today are not the only form of expression. The program broadcasts sound in stereo, moving from left to right as the independent variable increases. It also adds white noise when the function is negative and none when it is positive. The tone of the sound changes as the values become more extreme. It also helps students to have a printout of the graph, but *Triangle* allows them more instantaneous

Grisha Stewart and Jennifer Kosiak

results, bringing them more to the level of their sighted peers. Professor Gardner and his group are working on beta tests now, and those who are willing to test the program are welcome to a copy.

Yet another innovative learning aid is FlashPlus Tools. It incorporates sounds, closed captioning, large print, mathematics, and a lot of fun! This interactive tools bundle illustrates something that Professor Gardner finds very important. Instead of making one program for the sighted, a separate application for the blind, another for the deaf, etc., the program has many accessibility features built in. It would be very helpful if teaching tools, communications systems, and other necessities of life were built to accommodate all users. This method of design would not only help people with disabilities, but would help everyone to "visualize" in different ways.

The final speaker was Andrew Odlyzko of AT&T Labs, who spoke about the Web and its impact on research. He gave an example of a web site designed by fellow AT&T researcher Neil Sloane. The *Encyclopedia*

of Integer Sequences gives mathematicians and other sequencing enthusiasts a comprehensive and searchable source of known sequences. The page, which received 119,563 hits in October of 1999, can be found online at www.research.att.com/~njas/sequences.

Dr. Odlyzko used the examples of the postal service, the telephone, and other technologies to show that the Internet is not growing on its own, but is part of a trend towards increased communication. In 1790, the postal service delivered 8 million letters. The average person received 0.2 pieces of mail that year. By 1998, the postal service delivered almost 200 billion pieces of mail and the average person received 733 pieces! The telephone and other forms of communications had a similar increase over time. "The Internet," says Dr. Odlyzko, "is just the latest phase of this trend in increased communication." He believes that in less than ten years, the Internet will replace traditional journals and be well on its way to changing the face of the library. There will be large changes in the nature of scientific research, but

Gisha Stewart, Minde Bolz, Diana Sepehri, Andrea Frazier, Lenore Blum, and Felix Browder

this will take time because of human habits. He feels that a lot of benefits have already been realized and there are many more to come.

What Makes Hard Problems Hard?
A New View of Algorithms' Intractability

Around fifty people attended Jennifer Tour Chayes' fascinating Saturday morning topical lecture. Lenore Blum, former president of AWM, introduced the well-known speaker. In addition to leading a research group of mathematicians, computer scientists, and physicists at Microsoft, Chayes is a faculty member of both the physics and the mathematics departments of University of Washington and has many other distinguished appointments. In her free time, Chayes reports that she "enjoys overworking."

Dr. Chayes addressed the problem of determining when a problem is "P" or "NP." In other words, one attempts to use the physical structure of a problem to determine whether or not it is possible to find an algorithm to solve the problem in time expressible as a polynomial ("polynomial time"). She and her team look at the phase changes, which, as a physicist, she describes as the "appearance or disappearance of long range order." But she is also a mathematician, so that her interpretation of a phase transition is "nonsmoothness which appears in relevant quantities as the system gets larger." There are two interesting types of phase transitions in that case: first-order (jumps) and second-order (kinks).

"Hard problems" are those for which all possible algorithms require exponential amounts of time to run. Many examples illustrated Dr. Chayes' point that current views of what make problems hard are not necessarily correct. It is important to determine the most time-consuming example of a problem, which is often near the transition between two phases. One example she used is the Potts model, a lattice of points assigned various colors in which the energy of each point is the sum of the number of its neighbors that are differently colored than itself. The equilibrium state at each temperature has the number of elements with a certain number of different neighbors proportional to $\exp(-bH)$ where b is proportional to the inverse of the temperature and H is the number of neighbors. At high temperatures this will be completely random, but at low temperatures large clumps of identical colors will form. The equilibrium state at very low temperatures has only one color, but many algorithms have difficulty changing the large clumps into a single state. The Swenson-Weng technique, which sometimes swaps entire blocks of colors, may be used in statistical and particle physics. It is a fast algorithm for small amounts of colors or for low temperatures, because it is a non-local method for flipping colors, yet even this "fast" algorithm is slow at the transition point between order and disorder. The Microsoft team is now looking at the disordered state to find a more efficient algorithm.

Dr. Chayes and her team have found that the hardest problems are concentrated at the phase transition and are determined by the phase structure. While first order and phase coexistence may not always lead to hardness, phase coexistence and a complicated phase structure do lead to hard problems. For disordered systems with complex random phase structures, it may be difficult or impossible to devise faster algorithms.

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MATH 2000

McMaster University, the University of Waterloo, the Canadian Mathematical Society, the Canadian Applied and Industrial Mathematics Society, the Canadian Operational Research Society, the Canadian Society for History and Philosophy of Mathematics, the Canadian Undergraduate Mathematics Conference, and the 14th Canadian Symposium on Fluid Dynamics have joined together to celebrate World Mathematical Year 2000. This joint meeting is to be held at McMaster University, Hamilton, Ontario, June 10–13, 2000 and will bring together researchers, educators and students from around the world. Please join us at MATH 2000.

Information concerning the programs will appear at www.cms.math.ca/CMS/Events/math2000 as it becomes available. Meeting registration forms, abstract forms, and hotel accommodation forms will be available. Limited funds are available to partially fund the travel and accommodation costs for graduate students. For more information, please contact the Meeting Committee at gradtravel-math2000@cms.math.ca.

SONIA KOVALEVSKY HIGH SCHOOL MATHEMATICS DAYS

New College of USF, Sarasota, FL

On November 6, 1999 New College of the University of South Florida held its first Sonia Kovalevsky High School Math Day. The event brought to New College nearly sixty high school math teachers and students from 19 different schools and several people from the community. Several New College students, faculty and staff also attended the event. The event was hailed a great success by most participants, but many found it a little too long. It went on from approximately 9 A.M. to about 5:15 P.M.

The event did not have a single theme but sought to expose teachers and students to as many topics and facets of math as possible. Registration began at 9 o'clock.

Eirini Poimenidou, Associate Professor of Mathematics, New College

Attendees were given registration packages containing program information, the *Careers that Count* booklet, a short biography of Sonia Kovalevsky, and information on AWM. After a short welcome by the campus top academic officer, Dean and Warden of New College, Dr. Michael Bassis, we began with our first plenary session. The keynote speaker, Professor Sylvia Bozeman (Spelman College), gave an inspiring 45-minute presentation on "Mathematics for a High Tech Career." The talk was delivered beautifully and was well-received. After a short break, we offered two parallel one-hour workshops, one for the teachers and one for the students. Professor Natasha Jonoska (USF, Tampa) led the teacher workshop on "Mathematical Biology," a curriculum enhancement project. The student workshop was led by the author, Professor Eirini Poimenidou (New College), and introduced some of the ideas and mathematics of "Public Key Cryptography." Lunch was provided for all the participants following the morning sessions. During lunch, two New College students Deborah Herbstman and Andrea Saunders presented a fifteen-minute talk on Sonia Kovalevsky's life. Their presentation was very inspiring and well-organized. The long lunch break was followed by the

New College SKHS Day

afternoon parallel teacher and student workshops. The teacher workshop was led by Professor of Mathematical Education, Gladis Kersaint (USF, Tampa) and focused on "Girls and Math." Professor Patrick McDonald who spoke on "Playing to Win" offered the student workshop. A short break was followed by a group photograph and led to the next two parallel sessions. The teacher session was a panel discussion that was coordinated by Professor Elizabeth Larkin (USF, Tampa) and included short presentations by Professors Bozeman (Mathematics, Spelman College), Gilchrist (Biology, New College) and Kersaint (Math Education, USF). In the meantime, the students participated in a team competition trying to solve two problems on ideas from the morning and afternoon student workshops. A short break was followed by the final plenary session of the day on "Pythagorean Triples and Art." The charismatic presenter was the Mathematics Coordinator of Ringling School of Art and Design, Mr. John Sims. His presentations included videos and visual interpretations of mathematical theorems and was exceptionally effective. It was nearly five o'clock when the last presentation was over. The closing ceremony included the awarding of prizes to the winning teams. We had in fact a tie for first place and five students were each awarded a $50 gift certificate (Barnes and Noble). Finally the participants filled out our evaluation forms. Before leaving, teachers received in-service credit certificates and students received certificates of attendance.

The web site http://www.sar.usf.edu/~poimenid/ SKHMD.html (which I created and maintained) provides detailed information on participating schools and our program.

It is my assessment that the event was a great success despite some shortcomings, such as clashing with an SAT test day and being a little too long. We look forward to organizing our next Sonia Kovalevsky High School Math Day at New College soon. Several participating teachers offered to help organize and publicize subsequent SK events.

Saginaw Valley State University

The Department of Mathematical Sciences at Saginaw Valley State University conducted its first Sonia Kovalevsky High School Mathematics Day on October 29, 1999. Two hundred twenty-four high school girls from the ninth and tenth grades attended along with twenty-one of their teachers from twelve area high schools.

At registration participants were given a packet of information and other items. The participants were pleased to receive beautiful bookmarks provided by Barnes and Noble Booksellers. Additionally, Brooks/ Cole Publishing, a Division of Thomson Learning, supplied a large number of books for prizes together with a number of other items of a promotional nature. Other items were provided by the university. Both student participants and teacher participants enjoyed having a packet of items to take away from the event at the end of the day.

In the opening ceremony Dr. Gretchen Mooningham, organizer of the event, introduced Saginaw Valley State University President, Eric Gilbertson, who welcomed participants to the event and to the campus. One of the recurrent themes of the day was the importance of "sticking with mathematics" so as not to limit future career possibilities. In keeping with this theme, Dr. Jill Wetmore of the College of Business and Management and Dr. Sally Decker of the Crystal M. Lange College of Nursing and Health Science dropped by to greet the participants and to emphasize the fact that those seeking careers in business and the health professions need mathematics. As reflected in comments on the evaluation questionnaire at the end of the day, this was an eye-opener for many students.

Following these remarks, participants were treated to the presentation "Just Who Was Sonia Kovalevsky Anyway?" Written by SVSU mathematics education major Cindy Biermann, this presentation featured Cindy as narrator along with personal testimony by "Sonia," complete in period costume, as depicted by 1999 SVSU graduate Krisztina Varga. This presentation helped set the tone of the day by contrasting the struggle that Sonia Kovalevsky faced in achieving her career goals compared to the opportunities available to young women today.

Next students moved to a more informal setting in a large seminar room where they spent an hour working on fifteen thought-provoking mathematical competition questions. Students were assigned to teams of three or four people from different schools. Considerable effort had been devoted to making team assignments so that students on a particular team did not know one another. The questions were designed to lend themselves to group

effort. As hoped, most teams worked well together in tackling the problems and also in getting to know one another. The room was noisy with the conversations of all involved. Dr. Rose Novey, assisted by Dr. John Mooningham and Professor James Adams, graded the competition questions and determined the winning teams. Prizes were awarded later in the day. Following the competition and prior to lunch, students saw a brief presentation by Dr. Gretchen Mooningham concerning careers in mathematics.

After lunch a panel discussion was conducted with seven professional women who emphasized the value of mathematics to them personally and in their careers. The panelists included Sonia Beauregard, an electrical engineer with Delphi, Saginaw Steering Systems; Danita Douglas, an industrial engineer with GM Powertrain; Kenyatta Pryor, a chemist with Schaefer Technologies; Sandy Terbrack, Chairperson of the Mathematics Department at Heritage High School; Karen Sleno, Chairperson of the Mathematics Department at Flushing High School; Joanne Wittbrodt, Ph.D. candidate in chemistry at Wayne State University; and Barbara Zamora, plant engineer at Johnson Carbide.

All of the panelists were articulate and enthusiastic. Each of them described the responsibilities of her positions and her use of mathematics. Several expressed the sentiment that being a female in a male-dominated profession had proven an advantage for them. One panelist discussed how she balances her career along with a family. The idea that if a student is adequately prepared it is possible to achieve any career goal was stressed by several. The entire session presented mathematics and the use of mathematics in various careers in a very positive manner.

Following the panel discussion prizes were awarded to the top teams from the earlier competition. This was a departure from the planned schedule in which the awarding of prizes was to take place at the end of the day. This was due to the fact that several teachers had indicated that, due to transportation problems, their groups needed to leave before the planned departure time of 2 P.M.

The final activities of the day consisted of workshop presentations. Each student was assigned to two thirty-minute workshops. Everyone attended a presentation by the SVSU Admissions Office in which student were given pointers on how to prepare for college. Other workshops included a variety of mathematics-related topics. Some of the students had the opportunity to visit the Marshall M. Fredericks Sculpture Gallery on the SVSU campus. At the sculpture gallery students received a worksheet emphasizing mathematical considerations in the construction of large sculptures. Members of the Department of Mathematical Sciences at SVSU provided other workshops. Dr. Michael Gilbert showed the students several "picture" proofs, while Professor Andrew Tierman collected data from the students and, by use of a statistical calculator, performed linear regression on that data. Professor Timothy Weier presented "Something Fishy About Scaling," a talk on scale factors, and Dr. Thomas Zerger used computers for an interactive presentation on geometry. Teachers were invited to attend any workshop they wished. Many had already taken the opportunity to visit the Sculpture Gallery which had been opened specially for them in the morning. All of the workshops were well received. Some of the students found them to be the most enjoyable and helpful part of the day.

Since the awarding of prizes originally scheduled for the closing ceremony had been done earlier in the day, the workshops concluded the day's activities. Although everyone had been reminded to drop off their evaluation forms before leaving campus, with this change in schedule, many failed to do so. Those that were returned, however, indicated an overwhelmingly positive assessment of the day and its activities. Teachers were extremely appreciative and were enthusiastic in their willingness to participate in future Sonia Kovalevsky days.

Wright State University

On Tuesday, October 19, 1999, Wright State University's Department of Mathematics and Statistics held its second (hopefully annual) Sonia Kovalevsky High School Mathematics Day in conjunction with a "Yes, You Can!" conference co-sponsored by the Greene County Career Center (GCCC) (Wright State is located in Greene County, OH). As a result of the collaboration, we dramatically increased attendance from 24 participants at our first SK Day in 1998 to 184 participants. In addition to the participants, there were 32 presenters, planners and faculty members in attendance.

Dottie Meade, Career Coordinator and our co-planner from GCCC, contacted counselors from Greene County schools and arranged buses and substitute teachers. She

also contacted several speakers and arranged some of the sessions at our conference.

The day began with a warm welcome from Dr. Michele Wheatly, Chair and Professor of Biological Sciences, representing the president of WSU, and Dr. Manley Perkel, Chair and Professor of Mathematics. Dr. Perkel provided a moving kickoff for the day by sharing facts from the biography of Sonia Kovalevsky in a dramatic way. He ended with the question, "Would Sonia Kovalevsky have dared to dream that one day 200 young women would not only be welcomed to a university, but welcomed by the chair of its major science department, a woman, and by a director of a major science and industry museum, a woman who has walked in space?"

We were pleased to have as our keynote speaker Kathryn Sullivan, Ph.D., President and CEO of COSI-Columbus, one of two Centers of Science and Industry in Ohio where families, kids, students and adults can have hands-on experiences and learn about science. Dr. Sullivan, a former NASA astronaut, is now an oceanographer. She was the first American woman to walk in space. Her Ph.D. is in geology with a specialization in deep-sea research. Dr. Sullivan delivered an energetic, multi-media keynote address with the message that you should have a dream and not let anyone discourage you from pursuing your dream.

After Dr. Sullivan's talk, students proceeded to their choice of eight concurrent one-hour sessions. Students were able to participate in two sessions which varied in content and style from hands-on work sessions (graph theory, analyzing games, code-breaking, probability, electron microscope) to demonstrations (laser lessons, geology core samples) to panel discussions (majoring in non-traditional fields, running your own business, being a scientist).

Amy Bellis from the National Security Agency provided another highlight of the day. She ran two work sessions on code-breaking, and students gave these high marks.

In general, participants enjoyed the sessions and gave the day a positive evaluation. The responses reveal that they enjoyed hands-on working sessions more than panel discussions. In the future, panel discussions will only be used when a hands-on session or demonstration is not possible, and we will arrange the day so that students will attend no more than one panel discussion.

Invitations and flyers went out from the Greene County Career Center to all high schools and junior high schools in Greene County. Girls in grades 9-11 were invited. (Greene County's funds were from a grant meant to serve 9th through 11th graders, but not seniors.) Invitations and flyers went out from Wright State University to mathematics teachers in several public high schools in Montgomery County. Girls in grades 9-12 were invited with these letters.

Wright State University's Office of Marketing and Communications put out a news release inviting television, radio and print media to cover the conference. Reporters from a radio station and a television station were on hand. Both interviewed Dr. Sullivan. The television reporter interviewed Ann Farrell and two students and filmed in three sessions. The story was aired on the local news that evening. Greene County Career Center's Public Relations Director invited local media, and a snapshot appeared in the Fall 1999 GCC newsletter.

Information about the conference and an agenda were available on the WSU Department of Mathematics and Statistics web page http://www.math.wright.edu/MS/News/SKDay.html.

Amy Bellis (NSA) and students working on code-breaking

AWM Workshop: Irina A. Berchenko at her poster
with Jodie Novak and Helen Moore

AWM Workshop: Jennifer Joy Ziebarth
at her poster with Ruth Charney
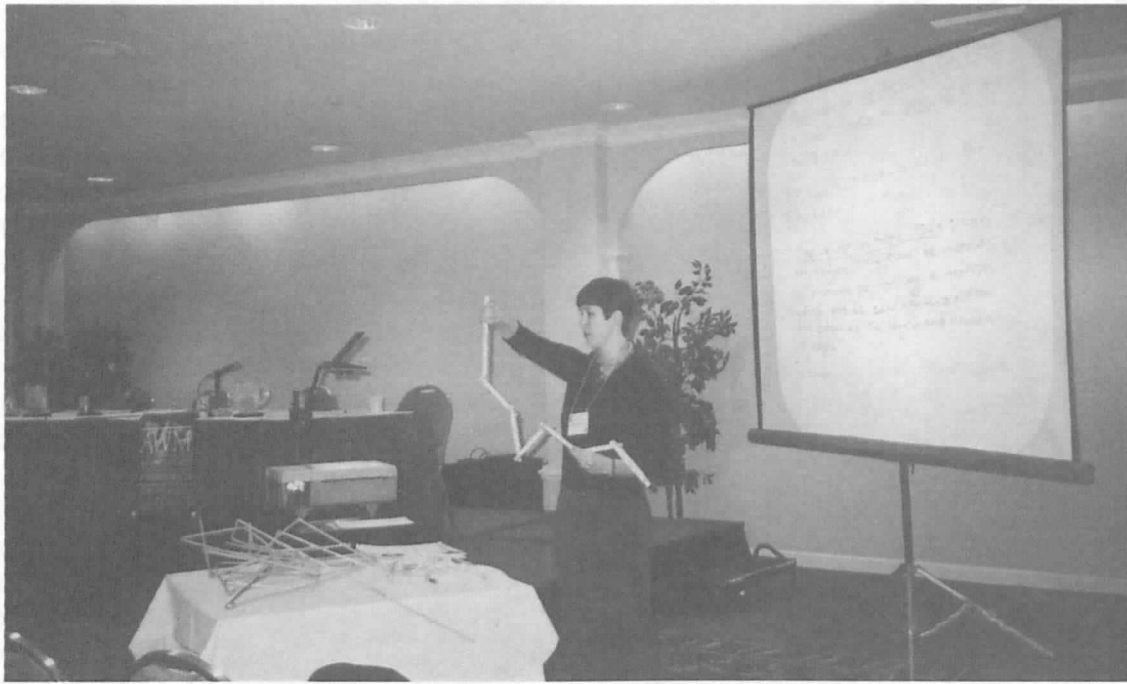
AWM Workshop: Heather Johnston
speaking on polygonal knot theory

AWM Noether Lecturer Margaret H. Wright with AWM President Jean Taylor

AWM Hay Award winner
Joan Ferrini-Mundy

AWM President Jean Taylor, and AWM
Schafer Prize Winner Mariana E. Campbell

AWM Panel: Karen Uhlenbeck, Millie Dresselhaus, Peter Sarnak,
Maria Klawe, Elaine Hansen

AWM WORKSHOP: Focus on Research & Career Advice

held in conjunction with the 2000 SIAM Annual Meeting (July 9 - 14, 2000),
Westin Rio Mar Beach Resort, Rio Grande, Puerto Rico

> **Schedule as of April 15, 2000**

The Association for Women in Mathematics (AWM) plans a workshop from Sunday evening through mid-day Tuesday, July 9-11, 2000. These events are held in conjunction with the 2000 SIAM Annual Meeting. AWM and SIAM welcomes your participation.

The sessions focus on showcasing the research of women graduate students and recent Ph.D. mathematicians and helping individuals to prepare for careers in the mathematical sciences. Our first session is a minisymposium, which focuses on career planning and experiences. The workshop also has two research minisymposia presented by recent Ph.D. mathematicians and a poster session presented by graduate students. In addition, starting off our events on Sunday evening will be a dinner and discussion groups.

There is NO registration fee for this AWM workshop. The minisymposia and poster session are **open to all SIAM meeting attendees**. Pre-registration for the AWM dinner is required. Tickets on-site will be very limited. Individuals can inquire about dinner ticket availability by contacting the AWM Office, 4114 Computer & Space Sciences Bldg., University of Maryland, College Park, MD 20742-2461; phone 301-405-7892 or email awm@math.umd.edu. For further information on the workshop, contact the workshop chairperson, Suzanne Lenhart (lenhart@math.utk.edu) or Dawn Wheeler at AWM Office (awm@math.umd.edu)

LOCATION: *Westin Rio Mar Beach Resort* [rooms below subject to change ↓]

Sunday, July 9, 2000

Caribbean Ballroom 3

7:30 p.m. - 10:00 p.m.   **AWM Dinner Banquet**
[see AWM staff on-site for ticket availability or email awm@math.umd.edu prior to the meeting]

Monday, July 10, 2000

Parrot Room

10:30 a.m. - 12:30 p.m.   **AWM Minisymposium on Launching a Career (MS7)**

This minisymposium will feature four mathematicians/computer scientists in a variety of careers. The speakers will discuss their career experiences and give some advice on starting a career. A variety of opportunities will be discussed.

Organizer: Suzanne M. Lenhart, University of Tennessee, Knoxville and Oak Ridge National Laboratory
Speakers:

10:30 a.m.	*"DOE Labs: An Energetic Career in Mathematics"*	**Charles H. Romine**, Oak Ridge National Laboratory
11:00 a.m.	*"The Possibility Of Having Careers In Both Industry and Academia - Q: Sequentially or in Parallel?"*	**Teresa D. Edwards**, Spelman College
11:30 a.m.	*"From Academe to Government: An Unexpected Opportunity"*	**Deborah F. Lockhart**, National Science Foundation
12:00 a.m.	*"Working in a Multidisciplinary Environment"*	**Mary F. Wheeler**, University of Texas at Austin

Canary Room

4:00 p.m. - 6:00 p.m.   **AWM Minisymposium on Biological and Physical Modeling Applications (MS13)**

This minisymposium will feature talks by female recent Ph.D.'s on modeling applications of mathematics in various scenarios. Most of the applications involve ordinary or partial differential equations, governing biological models. One talk involves solar magnetohydrodynamcis.

Organizer: Suzanne M. Lenhart, University of Tennessee, Knoxville and Oak Ridge National Laboratory
Speakers:

4:00 p.m.	*"Models for Two Problems in Solar Magnetohydrodynamics"*	**Katherine F. Gurski**, NASA Goddard Space Flight Center
4:30 p.m.	*"Spatio-temporal studies of the Mitotic Clock in Avasular Tumor Growth and Treatment"*	**Trachette L. Jackson**, Duke University
5:00 p.m.	*"Simulations of flows driven by pumping without valves using the Immersed Boundary Method"*	**Eunok Jung**, Oak Ridge National Laboratory
5:30 p.m.	*"Diseases with Chronic Stage in a Population with Varying Size"*	**Maia Martcheva**, Polytechnic University

AWM WORKSHOP: Focus on Research & Career Advice

Tuesday, July 11, 2000

Canary Room

10:30 a.m. - 12:30 p.m.   **AWM Minisymposium on PDEs and Applications (MS22)**

This minisymposium will feature talks by female recent Ph.D.'s speaking on partial differential equations and various models. A variety of types of equations with theoretical and numerical results will be included.

Organizers: Teresa D. Edwards, Spelman College
Speakers:

10:30 a.m. *"Interactions of Galerkin-Least-Squares stabilization and control design for Burgers' Equation"*	**Jeanne A. Atwell,** Virginia Tech
11:00 a.m. *"Recent Developments on Semipositone Systems"*	**Maya Chhetri**, University of North Carolina at Greensboro
11:30 a.m. *"Blow-up in a Reactive-Diffusive Medium with Spatially-Localized and Moving Heat Sources"*	**Colleen M. Kirk**, Montclair State University
12:00 p.m. *"Cylindrical Flame Dynamics"*	**Deborah Stevens**, Argonne National Laboratory

Parrot Room

12:30 p.m. - 1:30 p.m.   **AWM Poster Session -- poster presentations by invited female Graduate Students**
[AWM will have refreshment items available during the poster session.]

<u>**Graduate Student Presenters**</u>:

"Wavelet Homogenization Methods for Partial Differential Equations"	**Kirsten J. Boyd,** Stanford University
"A Mathematical Model of Benzene Metabolism in Vivo"	**Cammey E. Cole,** North Carolina State University
"Potential Minimizing Configurations of Points on a Sphere"	**Ann Davis,** California State University at Northridge
"Inverse Problems in Underwater Acoustics in the Presence of Internal Waves"	**Urmi Ghosh-Dastidar,** New Jersey Institute Technology
"Beam Spreading of Higher Order Gaussian Modes Propagating through the Atmosphere"	**Yadira Vellon Gilchrest,** Naval Undersea Warfare Center and University of Central Florida
"Modeling Effect of Interleukin-2's Role in T Cell Homeostasis"	**Kimber Gross,** University of Houston
"A Model for Hormonal Regulation of the Menstrual Cycle"	**Leona Harris,** North Carolina State University
"Improved Parametric Images for Brain Positron Emission Tomography Studies Using Ridge Regression and Multi Grid Methods"	**Cristina Negoita,** Arizona State University
"Nonexistence of nonnegative solutions for a class of semilinear elliptic systems"	**Shobha Oruganti,** Mississippi State University
"Characterizing Second Order Properties of Second Order Random Processes via Wavelet Transforms"	**Sherry E. Scott,** University of Maryland, College Park
"Non-Newtonian effects on the motion of falling viscous drops"	**Linda B. Smolka,** Pennsylvania State University
"Nonlinear Wave Equations on the Two-Dimensional Sphere"	**Theresa A. Strei,** University of Nebraska, Lincoln
"The Effect of Mixing Distribution Misspecification in Poisson Mixed Models"	**Kimberly S. Weems,** University of Maryland, College Park
"Development of a Biologically-Based Controlled Growth and Differentiation Model for Developmental Toxicology"	**Shree Y. Whitaker,** National Institute of Environmental Health Sciences and North Carolina State University

Volunteers Needed - Volunteers are needed to be **"mentors"** at the **AWM Workshop (July 9-11, 2000)** held in conjunction with the SIAM Annual Meeting at the *Westin Rio Mar Beach Resort* (July 10-14, 2000). Mentors are matched with a recent Ph.D. who is giving a talk in the workshop. Mentors should attend the talk of their assigned mentee and give some constructive advice about the talk. If possible, the mentor should attend the AWM dinner to get introduced to the mentee or arrange to talk with the mentee at some other time. Volunteers are also needed to **participate in a "discussion group" session** on **Sunday evening, July 9** following the AWM Dinner. Career advice and situations will be discussed at the session. If interested, **volunteers should contact** Suzanne Lenhart (**lenhart@math.utk.edu**) or the AWM office (**awm@math.umd.edu**)

ADVERTISEMENTS

LYNDON STATE COLLEGE - DEPARTMENT OF MATHEMATICS AND STATISTICS - Tenure-track Assistant Professor, General Mathematics/Statistics, starting August 2000. Teach undergraduate courses in general mathematics and statistics to non-majors & majors. Responsibilities include advising, scholarly activity, and involvement in department and college committees. Doctorate in Statistics, Mathematics, or Mathematics Education. Particular interest/expertise with integration of technology into teaching and innovative curriculum in general mathematics. Commitment to college teaching excellence, scholarship & professional development and collegial and community service required. Send letter addressing qualifications and responsibilities, vita (listing names & phone numbers of at least 3 references), & statement of teaching and scholarship philosophy to: **Chairperson, Mathematics/Statistics Search Committee, c/o Dr. Paul F. Tero, Dean of Academic Affairs, Lyndon State College, Lyndonville, VT 05851.** Full position description at our website **www.lsc.vsc.edu/intranet** and follow the links. Review of applications will continue until a suitable candidate is found. Lyndon State College complies with state and federal laws related to equal opportunity and nondiscrimination.

UNIVERSITY OF MINNESOTA, MINNEAPOLIS - SCHOOL OF MATHEMATICS - Post-doctoral position available - Funding is anticipated for 1 or 2 Postdoctoral Associate positions in the School of Mathematics at the University of Minnesota-Minneapolis, beginning no later than September 1, 2000. The positions involve mathematical modeling of pattern formation in developmental biology, calcium dynamics in neural tissue, or modeling of cell and tissue movement. Applicants should have a Ph.D. in Mathematics, Science or Engineering and have experience in mathematical modeling in biology, biophysics or medicine. Degree required by beginning date of appointment. Knowledge of Fortran or C/C++ is also required. The immediate group consists of several researchers who are analyzing models of cell movement in single and multicellular systems, studying calcium dynamics in synaptic transmission, and studying signal transduction and pattern formation in developmental biology. In addition, the School of Mathematics and the Institute for Mathematics and Its Applications at Minnesota provide a very rich research environment for a post-doctoral fellow. Salary commensurate with qualifications and experience. The initial appointment will be for one year, with continuation contingent upon performance and availability of funding. Send curriculum vitae and description of research interests to: **Hans G. Othmer, School of Mathematics, University of Minnesota, 206 Church St. S.E., 127 Vincent Hall, Minneapolis, MN 55455. Email: othmer@math.umn.edu.** See also **http://www.math.umn.edu/** Arrange to have three letters of recommendation sent directly. Applications will be considered until the positions are filled. The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, national origin, sex, age, marital status, disability, public assistance status, veteran status, or sexual orientation.

UNIVERSITY OF RHODE ISLAND - DEPARTMENT OF MATHEMATICS - Lecturer, Mathematics (1 or 2 Positions) - Ph.D. in mathematics required by starting date. Demonstrated ability and experience to teach both lower and upper division mathematics courses is required. Preference will be given to applicants having shared research interests with current mathematics faculty. See our website **www.math.uri.edu/position** for further information. Position(s) are non-tenured track beginning in the Fall of 2000. Position(s) are limited to one year with renewal subject to performance review and budgetary approval. Review of applications will begin on May 15, 2000 and will continue until the position(s) has been filled. Submit a letter of application, curriculum vitae, and arrange for three letters of recommendation to: **Orlando Merino, Search Committee Chair, (Log # 021389), University of Rhode Island, P.O. Box G, Kingston, RI 02881.** The University of Rhode Island is an AA/EEO employer and is strongly committed to achieving excellence through increased diversity of its faculty, staff and students. Persons from under-represented groups are encouraged to apply.

University of California, Los Angeles
Department of Biomathematics
Graduate M.S. & Ph.D. Program

The UCLA Department of Biomathematics welcomes applications to its graduate program leading to the M.S. and Ph.D. degrees. The goal of the doctoral program is to train creative, fully independent investigators who can initiate research in both applied mathematics and their chosen biomedical specialty. The department's orientation is away from abstract modeling and toward theoretical and applied research vital to the advancement of current biomedical frontiers.

In addition to advanced training in biomathematics, applied mathematics, statistics and computing, the doctoral program provides doctoral-level competence in a biomedical specialty. Specialties include genetics, molecular biology, neurosciences, psychology, oncology, pharmacology and immunology.

Student Support available through NIH training grant and fellowships.

For information contact:
    Admissions Committee Chair
    Department of Biomathematics
    UCLA School of Medicine
    Los Angeles, CA 90095-1766

Telephone: **(310) 825-5554**
Fax: **(310) 825-8685**
Email: **gradprog@biomath.medsch.ucla.edu**
Web site: **http://www.biomath.medsch.ucla.edu**

Has your address changed?
Do you have a new position?
★ ★ ★
Please let AWM know!

Please inform us of <u>any changes</u>, so we can keep our database up-to-date. Let us know if you move, get a new job, change phone numbers, etc. We want to know. We don't want to lose contact with you. Because AWM sends the *Newsletter* by third class bulk rate, the post office will not forward mail to you or notify us of address changes. Therefore, we must rely on <u>YOU</u> to notify us of <u>ANY CHANGES</u>. Just fill out the changes using the form on the <u>BACK COVER</u> or drop us a postcard or e-mail, and we'll take care of it. Thanks.

    EMAIL: awm@math.umd.edu;
    TELEPHONE: 301-405-7892

ADDRESS: 4114 Computer & Space Sciences Bldg. University of Maryland, College Park, MD 20742-2461

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ASSOCIATION FOR WOMEN IN MATHEMATICS
1999/2000 MEMBERSHIP FORM

LAST NAME,   FIRST NAME   M.I.

ADDRESS_____

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AWM's membership year is from October 1st to September 30th. Please fill-in this information and return it along with your DUES to:
AWM Membership
4114 Computer & Space Sciences Building
University of Maryland
College Park, MD 20742-2461
The AWM Newsletter is published six times a year and is part of your membership. Any questions, please contact AWM at awm@math.umd.edu or (301) 405-7892.

Email:
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   ❑ **do not** publish home number

Work Phone:
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❑ ⇐ I <u>DO NOT</u> wish for my AWM membership information to be released for the **Combined Membership List.**

PROFESSIONAL INFORMATION:
Position:
Institution/Company:
City, State, Zip:

If student, GRADUATE or UNDERGRADUATE? (circle one)
If <u>not</u> employed, leave position & institution blank

DEGREES EARNED:

	Degree(s)	Institution(s)	Year(s)
Doctorate:			
Master's:			
Bachelor's:			

INDIVIDUAL DUES SCHEDULE

Please check the appropriate membership category below. Make checks or money order payable to: **Association for Women in Mathematics**. NOTE: All checks must be drawn on U.S. Banks and be in U.S. Funds. AWM Membership year is **October 1st to September 30th.**

REGULAR INDIVIDUAL MEMBERSHIP..	$ 50 _____
2ND FAMILY MEMBERSHIP..	$ 30 _____
(NO newsletter) Please indicate regular family member: _____	
CONTRIBUTING MEMBERSHIP...	$100 _____
RETIRED or PART-TIME EMPLOYED MEMBERSHIP (circle one)................................	$ 25 _____
STUDENT or UNEMPLOYED MEMBERSHIP (circle one)...	$ 15 _____
ALL FOREIGN MEMBERSHIPS (INCLUDING CANADA & MEXICO).......**FOR ADDITIONAL POSTAGE ADD** **All payments must be in U.S. Funds** using cash, U.S. Postal orders, or checks drawn on U.S. Banks.	$ 8 _____
BENEFACTOR [$2,500] or FRIEND [$1,000] (circle one)...	$ _____
❑ I am enclosing a DONATION to the **"AWM GENERAL FUND"**................................	$ _____
❑ I am also enclosing a DONATION to the **"AWM ANNIVERSARY ENDOWMENT FUND"**..........................	$ _____

Indicate if you wish for your **contribution(s)/donation(s)** to remain ANONYMOUS ⇨ ❑
Dues in excess of $15 and all cash contributions/donations are deductible from federal taxable income.

INSTITUTIONAL DUES SCHEDULE

M/J00

		U.S.	FOREIGN	
_____Sponsoring CATEGORY I (may nominate 10 students for membership).......................		$150	$230	_____
_____Sponsoring CATEGORY II (may nominate 3 students for membership)........................		$ 95	$120	_____

INSTITUTIONAL MEMBERS WILL RECEIVE <u>ONE</u> FREE JOB ADVERTISEMENTS **(up to four lines)** IN OUR NEWSLETTER PER YEAR. Advertising deadlines are the 1st of every EVEN month. All institutions advertising in the AWM Newsletter are Affirmative Action/Equal Opportunity Employers. Also, Institutions have the option to nominate students to receive the newsletter as part of their membership. NOTE: List names and addresses of student nominees on opposite side or attach separate page. [ADD $15 ($23 for foreign members) for each additional student add-on over initial 10 students for Category I; over initial 3 students for Category II]

❑   indicate if GIFT membership FROM: _____

TOTAL ENCLOSED $ _____

ADDRESS CORRECTION FORM

☐ Please change my address to:

☐ Please send membership information to my colleague listed below:

☐ No forwarding address known for the individual listed below (enclosed copy of label):

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Position_____Institution/Org._____

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Database Corrections
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4114 Computer & Space
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awm@math.umd.edu

AWM

ASSOCIATION
FOR WOMEN IN
MATHEMATICS

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