AWM
ASSOCIATION FOR WOMEN IN MATHEMATICS

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IN THIS ISSUE

PRESIDENT'S REPORT

In my long report on the San Antonio meeting that appeared in the last issue, I mentioned that there were topics I was saving "for the next time." Here they are!

Satter Prize

Lai-Sang Young (Arizona & UCLA) won the 1993 Satter Prize for her outstanding research on the ergodic properties of dynamical systems, in particular on the dynamics of strange attractors.

Professor Young was born in Hong Kong, was trained in mathematics in this country, and received her Ph.D. from the University of California at Berkeley, under Professor Rufus Bowen, in 1978. She has been a Sloan Fellow (1985/86) and is currently a recipient of an NSF faculty award for women scientists and engineers.

The Ruth Lyttle Satter Prize in Mathematics was established by the American Mathematical Society in 1990 through a donation from Professor Joan Birman (Columbia) to honor her sister's commitment to research and to encourage women in mathematics. The prize is awarded every two years to recognize outstanding contributions by a woman in the previous five years. The first Satter Prize was awarded to Dusa McDuff (SUNY, Stony Brook), who chaired this year's selection committee.

In her response to the prize citation, Professor Young made the following comment on women in mathematics: "There is no doubt that our situation has improved; life in academia for women is easier for my generation than for the generation before. I feel that more institutional support is still needed for women who try to juggle career and family, and a conscious effort on our part is necessary if we are to rid ourselves of the cultural prejudices that have existed for so long." She ended by thanking Professor Birman "for giving more visibility to women in mathematics."

The occasion of this prize reminds us of the good that can be achieved through federal support targeted for women and the value of prizes to increase the visibility of women mathematicians. It also

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The Association was founded in 1971 in Boston, MA. The purpose of the association is to encourage women to study and to have active careers in the mathematical sciences. Equal opportunity and the equal treatment of women in the mathematical sciences are promoted.
The *Newsletter* is published bi-monthly.
The Editor welcomes articles, letters, and announcements.
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shows that there are excellent mathematicians eligible for awards specially designated for women.

We extend to Lai-Sang Young AWM's warmest congratulations for her well-deserved Satter Prize.

The GRE controversy

The meeting in San Antonio of the multi-acronymic Joint Committee on Women in Mathematics, chaired by Beth Ruskai, gave rise to a very intense discussion on the issue of gender differences in the awarding of fellowships for graduate study and on the role of the GRE scores in this matter. The subject is important and the controversy is heated. We hope that there will soon be a report of the committee on the issue that will give our readership access to the different opinions and their supporting data.

The new office

As announced, the move took place. Ginny reminds me often than a move is as bad as two fires.... Well, we are neither burned nor wet, but it was not easy. Finally, the place is getting in shape. As too often in the last year, a large chunk of the work fell on Judy Green, who solved myriads of problems, small and large, with her usual effectiveness. Ginny Reinhart and Dawn Wheeler are now at the office helm, and things are back to (almost) normal. After two months without it, we finally have the connection for e-mail working. As our neighbor Bill Clinton experienced upon arrival at the White House, it is impossible to survive without e-mail! (No explanation needed for the addicted...) Our new electronic address is awm@math.umd.edu. Hope to hear from you! Offers of collaboration, ideas, good projects are welcome!

Welcome party

The University of Maryland gave a reception to welcome AWM to our new quarters in their College Park campus. Many friends and colleagues from the Washington, DC area joined us at the Rotunda of the building that houses the Department of Mathematics. Among them were representatives from MAA, AMS, NAM, CBMS, JPBM, as well as from NSF, NSA and other funding agencies, and from many colleges and universities of the area, and, of course, faculty members and graduate students of the University of Maryland Department of Mathematics. Dean Richard Herman and Professor Raymond Johnson, chair of the Department of Mathematics, gave welcoming remarks. We were pleased to have former AWM president Linda Keen, who came especially from New York, join the celebration.

Getting together with Maryland graduate students

At the end of March we had an encounter with a large group (including some men) of graduate students in mathematics from

the University of Maryland at College Park. The meeting was sponsored by Professor Rebecca Herb, AWM member and Graduate Student Director of the Math Department, and attended by several members of the faculty.

I presented an overview of what AWM is all about and of what programs we currently have under way. Then we had a very interesting and active dialogue about issues concerning them as graduate students and about possible initiatives to increase women's presence in mathematics. Several of these students have already worked in the office during the last few weeks, and many others expressed their intention to help us. They have already started doing so with their ideas and their interest.

Meeting planned

A meeting of women in mathematics in the DC area is being planned for the month of May, with the purpose of exchanging ideas, expressing concerns as well as suggesting how to address them, and exploring the opportunity of collective work. The Association is in great need of volunteers. From doing office jobs to devising new programs, all of us are needed.

And for all you people who are not near our new office, remember that good projects and programs can be devised and directed also from afar. (That's one of the advantages of e-mail!)

American Association for the Advancement of Science

Thanks to the efforts of former AWM president Alice Schafer, chair of Section A (Mathematics) of the AAAS, AWM became an affiliate of AAAS at their annual meeting last February. Thus we joined about three hundred other professional and scientific organizations and academies that are under the umbrella of AAAS.

It is with pleasure that we acknowledge a prominent item on AWM that appeared in the "Inside AAAS" section of the 26 March, 1993 issue of *Science*, the official AAAS journal, in which our activities are described and our recent relocation is announced.

Out-of-court settlement

We have learned from Professor Jenny Harrison that she has signed an agreement with the University of California at Berkeley, where her tenure case will be reconsidered.

As we are all aware, Professor Harrison was denied tenure in 1986 and filed a sex-discrimination lawsuit in 1989. According to *Science* (19 March 1993, p. 1683), the out-of-court settlement calls for an outside committee of mathematicians to review Harrison's work and make a tenure recommendation. (For more details, see the article on page 8.)

This is, indeed, a positive step toward the academic resolution of such conflicts (see the May-June 1992 *Newsletter* for the AWM guidelines on dispute resolution adopted in January 1992).

We hope one result of this settlement will be that women no longer have to engage in such enormous expenditures of time and energy (and, of course, money) to get fair academic treatment.

We wish Jenny well in this new phase.

Future activities

During the remainder of 1993 several international meetings will address questions concerning women in mathematics.

Former AWM president Mary Gray will be AWM representative to the second meeting of the European Women in Mathematics (EWM) in Warsaw, as well as to the first meeting of the Palestinian Mathematical Society in Birzeit, both next June.

In August, AWM will sponsor — together with the Committee on Women of the Canadian Mathematical Society — a panel on affirmative action at the Joint Mathematics Meetings in Vancouver.

Another bilateral international meeting is planned, this time between AMS and the Sociedad Mexicana de Matematica in Merida, Yucatan, in December. We believe our participation is also important there and will strive to make it a reality.

The creation of solid working ties with our colleagues in Canada and Mexico, as well as with those in Europe, seems particularly appropriate at this time of increasing global awareness of the need to ensure women's right to mathematics.

Cora Sadosky

MEMBERSHIP AND NEWSLETTER INFORMATION

Membership dues (1993-94)

Regular: $40
Family (no newsletter): $30
  Base fees: $25 and $15 (regular and family)
  Prize Fund add-on: $5
  General funds add-on: $10
Student, unemployed, retired: $8
Contributing: $100
Institutional:
  Level 1 (two free basic ads and up to three student memberships): $80 ($105 foreign)
  Level 2 (two free basic ads and up to ten student memberships): $120 ($200 foreign)
    additional student memberships: $8 ($16 foreign) for next 15; $6 ($14 foreign) for remainder
Affiliate: $250
Corporate: $150

Subscriptions and back orders

All members except family members receive a subscription to the newsletter as a privilege of membership. Libraries, women's studies centers, non-mathematics departments, etc., may purchase a subscription for $40/year ($48 foreign). Back orders are $6/issue plus shipping/handling ($5 minimum per order).

Payment

Payment is by check (drawn on a check with a U.S. branch), U.S. money order, or international postal order. Cash payment will be accepted if necessary, but only in U.S. currency.

Ad information

AWM will accept advertisements for the *Newsletter* for positions available, programs in any of the mathematical sciences, professional activities and opportunities of interest to the AWM membership and other appropriate subjects. The Executive Director, in consultation with the President and the Newsletter Editor when necessary, will determine whether a proposed ad is acceptable under these guidelines. *All institutions and programs advertising in the newsletter must be Affirmative Action/Equal Opportunity designated.*
Institutional members receive two free basic ads as a privilege of membership. For non-members, the rate is $60 for a basic ad (eight lines of type). Additional lines are $6 each.

Deadlines

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

Addresses

Send all **Newsletter** material **except ads and book review material** to Anne Leggett, Department of Mathematical Sciences, Loyola University, 6525 N. Sheridan Road, Chicago, IL 60626; phone: (312) 508-3554; email: leggett@math.luc.edu; LMA24@LUCCPUA.BITNET; FAX: (312) 508-3514. Send all material regarding **book reviews** to Cathy Kessel, 2520 Etna, Berkeley, CA 94704; email: kessel@soe.berkeley.edu. Send everything else, **including ads and address changes**, to Dawn V. Wheeler, 4114 Computer & Space Sciences Building, University of Maryland, College Park, MD 20742-2461; phone: (301) 405-7892; email: awm@math.umd.edu.

MEMBERSHIP UPDATE

The first dues notice will be sent out in June if all goes well. This will spread out the workload at the office a bit. Hopefully more of us will be able to pay our dues by the October 1 deadline this way; those of you who can pay a little early will help the cash flow.

At the January meeting in San Antonio, the Executive Committee approved a number of changes in the membership rates and structure. In order that both family members may be properly included in the database, the former family membership for two members has been split; one family member will be a regular member, and the other will be a family member (at a reduced base rate). Affiliate membership has been raised from $150 to $250; corporate memberships have been introduced at $150. Foreign institutional rates have been established. Rates for additional students for institutional members (level two) have been added to the structure. The subscription rate has been raised to $40 ($48 foreign).

EWM MEETING

The next full EWM meeting will be the Sixth Meeting of European Women in Mathematics in the Mathematics Institute at Warsaw Technical University from 4th June till 7th June 1993. The program will include: expository mathematical lectures, talks and discussions on the theme "Creativity," meeting with and talk to Warsaw students of mathematics, general discussion on the situation of women mathematicians in different countries (especially in East and Central Europe), and organization and business for EWM. The expository talks will be open to the general mathematical public.

The tentative list of invited speakers includes: Z. Adamowiczw (Warsaw), V. Balladini (Lyon), I. Kersten (Bielefeld), H. Bacelar-Nicolau (Lisboa), D. Przeworska-Rolewicz (Warsaw), C. Geijsel (Amsterdam), and M. Gray (Washington).

If you would like to attend, please contact the organizers in Poland. Write Dr. Anna Romanowska, Instytut Matematyki, Politechnika Warszawska, Plac Politechniki 1, 00 661 Warsaw Poland, or email ewm@plwatu21.bitnet.

F. N. DAVID WINS FIRST ELIZABETH L. SCOTT AWARD

Florence Nightingale David received the first Elizabeth L. Scott Award at the Joint Statistical Meetings held in Boston, Massachusetts, August 1992, "for her efforts in opening the door to women in statistics; for contributions to the profession over many years; for contributions to education, science, and public service; for research contributions to combinatorics, statistical methods, applications, and understanding history; and her spirit as a lecturer and as a role model."

F. N. David has had a long and distinguished career as a statistician. Born in 1909, she received her doctorate in statistics from University College, London, in 1938, and returned there after the war in 1945, eventually becoming Professor in 1962 (the same year Elizabeth Scott became Professor at the University of California, Berkeley).

In 1968 F. N. David moved to California, ultimately becoming Professor and Chair of the newly formed Department of Statistics at the University of California, Riverside; she retired in 1977 and moved to the University of California, Berkeley, where she continued to be active as Professor Emeritus and Research Associate in Biostatistics. Professor David is the author of many books and monographs, as well as over 100 scientific papers. She was elected a Fellow of the Institute of Mathematical Statistics (IMS) in 1946 and of the American Statistical Association (ASA) in 1954, an Ordinary Member of the International Statistical Institute (ISI) in 1951, and has received numerous other academic honors.

Now of course there are many others who have such distinguished careers, but consider these stories from the conversation between F. N. David and Nan M. Laird [*Statistical Science* 4(1989): 235-246]. When F. N. David was trying to decide on a career she wanted to be an actuary. But she was told "the actuaries would only take men." Early in her career she got turned down for some jobs, not because she wasn't qualified, but because "they hadn't got facilities for women to use the toilets." At University College, London, they had a society for scientists on the faculty, but "they wouldn't have women — so [she] founded one which would have both men and women." It was in that atmosphere that Professor David developed her prestigious career, and it is because of her and other women of her generation and the next that women will never have to face those overt obstacles.

F. N. David once said that she didn't think it was her job in life to be influential. But like it or not, her very existence and perseverance in the academic world has made her so.

Professor David was not present to accept the award in person, but Lucien M. Le Cam (University of California, Berkeley) read out the following message:

> I am sorry not to be present in person to say that I am honored to have been chosen as the recipient of the Elizabeth Scott Award. I go back a long way in time. I started my academic life in 1929 and wanted to be an actuary. So in 1931, I visited an insurance firm to ask about applying for a career fellowship. I was turned down and when I asked why I was told that although I was the best qualified person applying I was a woman. I went home raging to my father but all he said was "You will meet this all your life. Go away and get on with your work." Fortunately a week or two later I went to see Karl Pearson who was encouraging, giving me a place in his laboratory and seeing that my college scholarship was extended. And so I learnt the two lessons which have haunted me all my life. First that women tend to be unfairly treated and second that if you persevere difficulties can be overcome. Now, due in the main to the opportunities of the 1939-45 war, conditions are better for women but it is still important to remember to teach the young that when you meet a set-back don't sit down and weep, go and get on with your work. Thank you all for the award and for listening.

The Elizabeth L. Scott Award is sponsored by the Committee of Presidents of Statistical Societies (COPSS), representing the Institute of Mathematical Statistics (IMS), the American Statistical Association (ASA), the Biometric Society (Eastern/Western North American Regions, ENAR/WNAR), and the Statistical Society of Canada (SSC).

The 1992 Elizabeth L. Scott Award Committee comprised Virginia F. Flack (University of

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California, Los Angeles – WNAR), Barbara A. Bailar (ASA Executive Director), Lynne Billard (University of Georgia, Athens – ASA), Reginald J. Kulperger (University of Western Ontario, London – SSC), Jessica M. Utts (University of California, Davis – IMS: chair), and Linda J. Young (University of Nebraska, Lincoln – ENAR). On behalf of the Elizabeth Scott Award Committee, Jessica Utts observed that:

> The Elizabeth Scott Award is designed, of course, to honor two people, one of whom is the recipient, and the other of whom is Elizabeth Scott herself. Elizabeth Leonard Scott died on 20 December 1988 [*The IMS Bulletin* 18(1989): 80] shortly after her 71st birthday, leaving behind in many of our minds memories of a feisty and determined yet warm and generous individual. She started her career as an astronomer, receiving her B.A. in 1939 and her Ph.D. in 1949, both at the University of California, Berkeley, and both in astronomy. But she was already publishing statistical papers when she received her Ph.D., and by 1962 she had been promoted to Full Professor in the Department of Statistics at Berkeley. Elizabeth Scott worked on a wide variety of applications of statistics in addition to those motivated by astronomy, but it was in the early 1970s that she began what became a passion for her — studying and working to improve the status of women in academia. She published several papers on this, in which she compared salaries of faculty women with those of faculty men and found a substantial difference despite equal qualifications. She was a role model and advocate for many young women scientists and took an active interest in this endeavor even after her retirement. In fact it is my understanding that her last public lecture was at the Pathways to the Future Workshop for new women researchers at the Annual IMS meeting in Fort Collins, Colorado, in 1988. I was fortunate enough to hear that lecture, which unfortunately convinced me that there is still much to be done in this area.

The idea for the Elizabeth Scott award originated when the IMS Business Manager, Jose L. Gonzalez, noted upon her death that Elizabeth Scott was the only woman who had ever served as President of the Institute of Mathematical Statistics (IMS). In August 1989, the IMS Council formed an *ad hoc* committee consisting of Jessica M. Utts (University of California, Davis), Nancy M. Reid (University of Toronto), Marjorie G. Hahn (Tufts University), and J. Michael Steele (University of Pennsylvania) "to recommend an appropriate activity to honor the memory of Elizabeth Scott." As with all good ideas, this one grew, and it was taken over as a COPSS activity the following year. Rightly, since Betty was indeed active outside of IMS, having served for example as a president of the Bernoulli Society for Mathematical Statistics and Probability and as a vice-president of the American Statistical Association (ASA) and the International Statistical Institute (ISI), and so her reputation and influence certainly extended to the international statistics community.

The current British £10 banknote features British nurse and medical reformer Florence Nightingale (1820-1910), who became famous for her work during the Crimean War (1853-1856), when she became known as the "Lady of the Lamp." She "had contact with Adolphe Quetelet (1796-1874) at the 1860 International Statistical Congress" and was "A Passionate Statistician" [*J. Royal Statist. Soc. Ser. A* 144(1981): 66-79]; see also the *Encyclopedia of Statistical Sciences* [S. Kotz, N. L. Johnson, and C. B. Read, eds., Vol. 6, pp. 246-249, Wiley, New York, 1985]. Florence Nightingale was elected an Honorary Member of the American Statistical Association in 1874 [*Amstat News* 184 (February 1992): 2] and was much admired by F. N. David's mother.

AWARDS AND HONORS

CONGRATULATIONS to the women listed below for their meritorious achievements.

The AMS is pleased to announce the 1993 awardees of the Waldemar J. Trjitzinsky Memorial Fund. The awards of $2500 each are granted to mathematics departments to assist needy students in mathematics. The departments are selected randomly from a pool of nearly 500 AMS institutional members. The schools receiving awards this year are: Allegheny College, Memphis State University, the University of California at Irvine, and the University of Puerto Rico. Each department selected one student to receive the award.

CASSANDRA BURNS, a senior majoring in mathematics, was selected by Memphis State. Paul Trow, the chairman of the undergraduate committee of the mathematics department, reports that Burns is a member of the Chi Beta Phi national science honorary fraternity.

JULIANNE STILE was selected by Allegheny College. Ronald Harrell, chair of the mathematics department, says that Stile showed high financial need as well as excellent scholastic performance. He also noted that faculty who have had her in class say she is a conscientious student with the potential to pursue graduate work in mathematics. [*Notices of the AMS*, February 1993]

JACQUELINE C. MOSS of Paducah Community College received a Certificate of Meritorious Service from the MAA.

Professor Moss joined the MAA in 1966 and has been a member of the Kentucky Section since then. She currently serves as Section Secretary-Treasurer, and has served as Section Governor and as a member of numerous MAA committees. At the national level, Professor Moss was elected as Second Vice-President of the Association. She has made contributions to other mathematical organizations, serving as President of the Kentucky Mathematical Association of Two-Year Colleges and as President of her local National Council of Teachers of Mathematics chapter.

Professor Moss has twice been honored as Teacher-of-the-Year at Paducah Community College where she has taught for 27 years. She has been similarly recognized within the statewide community college system.

Responding to the award, Professor Moss stated, "This is one of the real highlights of my teaching career. I have enjoyed every minute of my service because it has been rewarding and I have worked with some great people. I appreciate having had the opportunity to serve the community college movement and mathematics education in the state of Kentucky." [*FOCUS*, April 1993]

The American Association of University Women (AAUW) Educational Foundation has awarded fellowships and grants from under $1000 to $25,000 to 101 women. The awardees will do postdoctoral research, complete doctoral dissertations, or work on graduate degrees in professional fields in which female participation has traditionally been low.

Among the awardees are three in the mathematical sciences who received dissertation fellowships. ELSA NEWMAN of Emory University is working on some direct and inverse problems in geometric optics; REBEKAH VALDIVIA of Washington State University is working on a reaction-diffusion model of transdermal drug delivery; and JANET WOODLAND of the State University of New York at Stony Brook is working on geometric and statistical methods in the computation of topological invariants of lattice-gauge fields. [*Notices*, January 1993]

DIANE M. HENDERSON, assistant professor of mathematics at Pennsylvania State University, has received a five-year $500,000 Fellowship in Science and Engineering from the David and Lucile Packard Foundation. The fellowship is one of twenty awarded nationally this year.

Established in 1988, the Packard Fellowships provide unrestricted funds to young faculty in the natural sciences and engineering who have demonstrated unusual creative ability in research. Henderson's work centers on the behavior of waves in fluids. In nominating her for the award, Jerry L. Bona, head of the mathematics department at Penn State, said, "Her experimental technique is phenomenal and her insight into the properties of fluids belies her age. Especially unusual is her grasp of the relationship between theoretical and practical issues and laboratory experiments."

Henderson's interests focus on doing experiments that can test and guide theoretical predictions about wave motion. Penn State's mathematics department is one of the few in North America that supports a fluid mechanics laboratory, allowing a combination of experimental, theoretical, and numerical research. Henderson says she plans to use the award primarily for laboratory equipment and to support graduate students.

Henderson earned her bachelor's degree in engineering sciences in 1984 and her master's degree in 1986, both from the University of Florida. She completed a doctoral degree in physical oceanography in 1989 at the Scripps Institution of Oceanography at the University of California at San Diego. Before coming to Penn State in 1991, she held a research position at the University of Florida. Henderson was awarded the Achievement Reward for College Scientists Fellowship at Scripps in 1989 and a National Science Foundation Young Investigator Award in 1992. [*Notices*, December 1992]

QUERY: We have an exchange subscription to *Chronique Féministe: Université des Femmes* (six issues per year). We need someone who reads French to receive it and then report to us on contents of special interest to AWM.

HARRISON SETTLEMENT

On March 7, 1993 the sex discrimination lawsuit of Jenny Harrison against the Regents of the University of California was settled out of court, and the trial is now stayed. Under the agreement the issue of Harrison's candidacy for tenure is under new review, which should resolve the matter fairly and to the satisfaction of all parties.

In 1986 Dr. Harrison was denied tenure at UC Berkeley's mathematics department. She filed suit in 1989 charging tenure discrimination after internal University grievance procedures failed to overturn the tenure denial. She was the first in the State of California to receive confidential files of others promoted to tenure. Her attorneys Dan Siegel and Anne Weills of Oakland maintain that these files showed that her promotion was treated differently than that of the eight men promoted to tenure in the math department during her time of employment. As a result of the recent settlement, Dr. Harrison's protracted battle finally seems to be drawing to a close.

Professor Morris Hirsch from the mathematics department said, "I have long admired Harrison's work and in the past I have strongly recommended her for tenure. I am delighted that the University has taken this step to correct the errors it made in her past tenure review."

Susan Butler, President of the AAUW's Legal Advocacy Fund which has supported Dr. Harrison for three years said, "The AAUW Legal Advocacy Fund is delighted a satisfactory settlement has been reached. We have supported many women with cases against UC: Jenny Harrison, Margaretta Lovell and Leigh Segel among others. We hope this settlement marks the beginning of progress for women in the UC system. "

Patricia St. Lawrence, Emeritus Professor of genetics at UC and a member of Harrison's Support Committee, said, "We are pleased that the University has decided not to further waste tax-payer's money with a trial that it could not possibly have won. We hope that the new tenure review will be fair and result in Dr. Harrison's promotion to tenure. Although it took them far too long, we applaud the University's decision to settle the case out of court."

Charity Hirsch, Harrison Support Committee

TEACHING AWARDS

AWM and MAA cohosted a reception at MAA headquarters to honor the 1992 Secondary Mathematics Awardees who received Presidential Awards for Excellence in Science and Mathematics Teaching. Congratulations to all of them!

These terrific teachers are: Kay Johnson Balch, Mountain Brook Junior High School, Birmingham, AL; Dick Sander, Ketchikan High School, Ketchikan, AK; Veronica Carlson, Moon Valley High School, Phoenix, AZ; Jane M. Jones, Goza Junior High School, Arkadelphia, AR; Glenys Bell, Brea Olinda High School, Brea, CA; Diane M. Weaver, Morey Middle School, Denver, CO; Patricia Cancilla-Hahn, Silas Deane Middle School, Wethersfield, CT; Pamela L. Warrick, Fulda American High School, Fulda, Germany; L. Charles Biehl, Thomas McKean High School, Wilmington, DE; Marion Paige Exum, Eliot Junior High School, Washington, DC; Carl C. Burnside, Cypress Lake High School, Fort Myers, FL; Gayle Garrison, Heritage High School, Conyers, GA; Chu Ying Singletary, Nanakuli High and Intermediate School, Waianae, HI; Eileen Gruenwald, Coeur d'Alene High School, Coeur d'Alene, ID; Nancy Powell, Bloomington High School, Bloomington, IL; Carolyn L. Mayes, Elkhart Memorial High School, Elkhart, IN; Jill Moser, Roosevelt High School, Des Moines, IA; Martha K. Tietze, Shawnee Mission Northwest High School, Shawnee, KS; Pamela M. (Harbin) Argabrite, Jeffersontown High School, Louisville, KY; Patricia Pohl Eberhardt, Hammond High School, Hammond, LA; Sandra E. (Betsy) Berry, Georges Valley High School, Thomaston, ME; Linda K. Agreen, Eleanor Roosevelt High School, Greenbelt, MD; Jane West Young, Newton South High School, Newton Center, MA; Anita M. Clark, Marshall High School, Marshall, MI; James M. Foley, Fred Moore Junior High School, Anoka, MN; Vicki Fortson Shirley, Corinth High School, Corinth, MS; Melinda Shields, Palmer Junior High School, Independence, MO; Karen Anderson Longhart, Flathead High School, Kalispell, MT; Tedi Lund, Millard North High School, Omaha, NE; Carol J. Ross, Green Valley High School, Henderson, NV; Arthur V. Johnson, II, Nashua Senior High School, Nashua, NH; Elizabeth Marquez, North Brunswick Township High School, North Brunswick, NJ; James F. Dudley, Rio Grande High School, Albuquerque, NM; Kay F. Toliver, East

Harlem Tech, New York, NY; Julia A. Cazin, Daniels Middle School, Raleigh, NC; Janet Washek, Jim Hill Junior High School, Minot, ND; Catherine J. Sanor, West Branch High School, Beloit, OH; Linda A. Hall, Clinton Middle School, Tulsa, OK; Kris A. Warloe, Cheldelin Middle School, Corvallis, OR; Debra Kerr, State College Area Junior High School, State College, PA; Julia Rodriquez, Tejas Second Unit, Yabucoa, PR; Mary M. Jerome, Thompson Junior High School, Newport, RI; Elizabeth H. Floyd, Pickens Junior High School, Pickens, SC; Carol Jenison Murphy, Rapid City Central High School, Rapid City, SD; John J. Brady, III, Brentwood Middle School, Brentwood, TN; Barbara (Basia) Rinesmith, Alief Elsik High School, Alief, TX; Etuale Tuileta, Leone High School, Leone, AS; Cindy Watson, South Ogden Junior High School, Ogden, UT; Eric Weiss, U-32 Junior/Senior High School, Montpelier, VT; Patricia Robertson, Williamsburg Middle School, Arlington, VA; William K. Kring, Sr., A. C. Davis High School, Yakima, WA; Lois Ann Swineford, Suncrest Junior High School, Morgantown, WV; Jodean E. Grunow, Dodgeville Middle School, Dodgeville, WI; and Richard D. Lechner, Greybull Middle School, Greybull, WY.

1993 SCIENCE AND TECHNOLOGY SYMPOSIUM

The 1993 Science and Technology Symposium, "Transportation and the Mathematical Sciences: The Changing Interaction," will be held in Washington, DC on May 13, 1993. The symposium will focus on the increasing use of the mathematical sciences in planning and operations for surface and air transportation. The topics to be discussed will include planning, legal/policy issues, and research issues as well as the roles of mathematics, statistics, and optimization in various areas of transportation.

Speakers will be George Nemhauser (Georgia Institute of Technology), Joseph Del Balzo, (Acting Administrator, Federal Aviation Administration), Joseph Hinson (Federal Express), Kevin Heanue (Federal Highway Administration), and Eric Pas (Duke University). Thomas Deen, Executive Director of the National Research Council's Transportation Research Board, will give the opening remarks. The Symposium will be held from 2 P.M. to 5:15 P.M. in the Auditorium at the National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington, DC. There is no registration fee, but people wishing to attend are requested to register in advance because of limited seating.

For information, write: Board on Mathematical Sciences, National Research Council, NAS, 2101 Constitution Avenue, NW, Washington, DC 20418; phone: 202-334-2421; FAX: 202-334-1597; email: bms@nas.edu or bms@nas.bitnet.

UNDERGRAD MATH CONFERENCE

Plans are afoot for a regional Hudson River Undergraduate Mathematics Conference at Albany next year (April 9, 1994). AWM will be one of the sponsors. The goal is to welcome interested students within a few hours of Albany to mathematics. The one-day conference will consist of talks by students and faculty, aimed either at majors or at calculus students. A morning coffee hour, lunch, and an early dinner/party will be provided. There will be one invited address, by John Conway.

For more information, write: Frank Morgan, Steering Committee, Williams College, Williamstown, MA 01267; phone: (413) 597-2437; email: Frank.Morgan@williams.edu.

AD DEADLINES CHANGED!!

Because the USPS has the right to hold bulk mail for up to a month before it is delivered, the *Newsletter* has not been reaching you as soon as we would like. For this reason, we are tightening up on the production schedule a bit. This has necessitated a change in due dates for ad copy. Ads must now be received by the *first* of even months rather than the fifth in order to be assured of appearing in the next issue.

IS GEOGRAPHY DESTINY? ONE PERSPECTIVE

In the fall of 1982, I was a graduate student at Yale University, completing a dissertation in harmonic analysis, and preparing to "go out on the job market." During the late 1970s and early 1980s, the academic job market — indeed, the whole U.S. economy — had been unsteady and unpredictable. In part to pay my way through school, and in part to gain a variety of work experience, I had held a succession of summer jobs in business and industry during my undergraduate and graduate days, preparing for the possibility that my career would *not*, in fact, be an academic one. As late as summer of 1982, I was not at all certain that I would even apply for academic jobs. But come the fall, emboldened by some successes I had recently had in research, and energized by a semester in the classroom, I decided to apply for a tenure-track job in mathematics.

The job market turned out to be much better than I had feared it would be; I received a handful of offers. In the end, it came down to a choice between two universities: one public, the other private; one rural, the other urban; one a technically oriented land-grant institution, the other a comprehensive university with a more traditional orientation toward the liberal arts and sciences.

I chose to come to Virginia Tech, Virginia's land-grant university, located in Blacksburg, in the southwestern part of the state — within a five-hour drive of Washington, the Research Triangle, and Knoxville, but somewhat off the beaten track. It was not, in the opinion of most people who knew me (my adviser for example!), the obvious choice. But I'd made the choice with my eyes open. Although I was a city kid, I had tired of living in dangerous urban areas and welcomed the slower pace and relatively safer conditions of small town life. Although my own formal education was undertaken in private schools, the populist and egalitarian instincts in me were drawn to the idea of teaching at a public institution. And I was eager to join what appeared to be a friendly, congenial department where one could find a good many analysts, though none working in harmonic analysis *per se*; I felt that I could easily find my niche there.

by Marge Murray, Virginia Tech (©1993, Marge Murray)

Ten years later, I am still at Virginia Tech, though the path that took me from that day to this was not at all what I expected. I have been pleased with the relaxed pace, and lower prices, of small-town life, but I have missed the stimulation of the big city much more than I had imagined I would. I have been pleased with my decision to work for a public institution, but have discovered some of the limitations of state universities, particularly in difficult budgetary times. And it has not always been easy to combat the sense of professional isolation I've felt as "the only" harmonic analyst in my department.

In what follows, I would like to share some of the lessons I have learned, as well as the adaptations I have made, as I have come to grips with the consequences of my geographic choice. In today's straitened job market, it is rare that new Ph.D.'s have the luxury of choosing among a variety of job offers when they emerge into their professional careers. On the other hand, many of the geographical challenges that I have met (by choice) during my career are in fact the same geographical challenges that new Ph.D.'s who are lucky enough to land stable academic employment face when they finally settle into the job they so desperately sought. I hope that some of my experiences and attitudes will be instructive.

I had the good fortune to depart graduate school armed with a most interesting battery of research questions in harmonic analysis; these questions formed the nucleus of my research program for many years. During my first two years at Virginia Tech, I volunteered to speak in any on-campus seminar which would have me, and became a zealous missionary, not only for my own work, but for other exciting work that was then being done in harmonic analysis. My seminars were generally fairly well attended, but in time I came to realize that I couldn't expect my colleagues to drop what they were doing and climb aboard my own research bandwagon. With this in mind, I began to knock on doors — in the department and across the campus — to introduce myself but, more importantly, to find out what other people were up to. In this way, I made a lot of new friends, I quickly came to know about the campus and its people, and I cultivated a core of colleagues, both inside and outside the department, with whom I was able to talk about my own life and work.

In my first two years out, I was called upon to teach a dizzying array of undergraduate courses.

The classic tension between teaching and research, which is often most acute for the untenured, was very difficult for me: it was all too easy for me to while away many happy hours preparing lectures, grading papers, and holding office hours. Perhaps because I had little success in finding research collaborators on campus, I invested much more of my interpersonal energies in my students. I hope that they benefitted. But I did begin to worry about how I would sustain my research.

Thus I considered it a stroke of great good fortune when I was invited to spend the Fall Semester of 1985 at the University of Texas at Austin, where John Gilbert was interested in jointly exploring the role of Clifford Algebras in harmonic analysis. Thus began a five-year long-distance collaboration, made possible in part by NSF summer support and travel funding. I made several trips to Texas annually, returning to Virginia each time with plenty of food for thought — and plenty of new work to do! While the collaboration was very good for my research career, it did have the unfortunate effect of isolating me a bit further from my Virginia Tech colleagues, for each time I returned from Texas I would hunker down in my office (or in my apartment) to continue the work.

Back in 1983, my rationale for seeking a tenure-track job was that I wanted to be "settled," but in the end, my visits to Texas — followed by a visiting position in Minnesota, which I sought out and obtained for 1988-89 — constituted the "moral equivalent" of a post-doc. (Of course, I have had the security of knowing that I have a home — and a job — to return to, here in the mountains of southwestern Virginia. This is not the situation of most academic post-docs, who trade security for the opportunity to concentrate on research.) Tenure (which I received in 1990) afforded me the opportunity to stop and catch my breath, and to take a look around me at my life and career, at my place in the University and the academic community more generally.

It is important to point out that, unlike many other women mathematicians, I have been able to pursue my career up to this point without worrying about the "two-body problem." This has afforded me a certain freedom to make my career up as I go along. This is not to say, however that personal considerations have played no part in my decision-making process. It is very important to me personally to feel a part of the community in which I live; having a "home base" is and continues to be a high priority. Perhaps because I had prior experience in non-academic employment, and because I have had teaching experience in a fairly wide variety of institutions (including a graduate school summer spent teaching in a community college), I have generally taken a broad view of what my "career" could be. When I was at Yale there was a tendency among graduate students to visualize their future careers as being, in essence, carbon copies of their advisers': lives spent devoted to research, first and foremost, and secondarily to classroom teaching. But there was ample evidence, even as early as the late 1970s and early 1980s, that higher education would undergo a kind of "restructuring" just as American industries had been doing for some time. I have never had any reason to expect that my life in academics would be even remotely like the life my professors have had. I have considered it my good fortune that I have been able to pursue my "first choice" of career, in teaching and research, but I think I would have found a *modus vivendi* if such a career had proved impossible. Given the rapid pace of change in the American economy, it's difficult to predict just how much longer the academic enterprise will continue in the form in which we've come to know it. I give thanks for the chance I have to contribute by teaching and learning, but I know better than to be carried away by the thought that this opportunity will continue indefinitely — tenure or not.

Is geography destiny? The answer for me is no. In your case, the answer is up to you.

Which brings me, at last, to the question of my title: is geography destiny? Are mathematicians, women in particular, constrained by their geographic circumstances? To some extent, yes — all the choices which we make in this life constrain us to one degree or another. But the degree of the constraint is as much determined by the limits of our imagination as by the reality of our circumstances. In my own experience, the best way to avoid a sense of geographic isolation is, first and foremost, to adopt and maintain a flexible attitude toward the meaning of the word "career." I have never taken a narrow view of the word, but rather have tried to think of my own as "vocation," and in that conception, *how* one lives is as important as the particular job one pursues or the place in which one pursues it.

Is geography destiny? The answer for me is no. In your case, the answer is up to you.

EDUCATION COMMITTEE

My Path to Mathematics

My name is Larisa Leshchenko. I was born on the 29th of March 1959 in a small picturesque village in the central part of Ukraine. My mother was a school teacher of history, and my father was a post-graduate student in the Institute of History of the Ukrainian Academy of Sciences. I spent my childhood mainly in the countryside with my grandmother and grandfather. Like the majority of children, I was curious and asked a lot of questions: "Why...?" Sometimes, my questions caused trouble because I believed only in logic and consistent answers.

In 1966 I entered school in Kiev. My parents tried to make my education all-round; that is why I also attended musical classes and gymnastics. I also liked poetry and adventure. I understood that my favorite subject was mathematics probably when I was ten years old. It was connected with the introduction of some complicated mathematical ideas and conceptions. Actually it was a great pleasure to solve intricate math problems and sometimes prove a theorem that had been proved ages ago. My parents did not understand my passion for math. Once I spent a lot of time and could not solve a problem, but when the solution was achieved I came to my mother with a feeling of pride and said, "Mama, look what a beautiful solution of the problem!" However, my mother was very disappointed because she could not understand that a solution of a math problem might be beautiful. She tried to explain to me that beauty deals with art and harmony, whereas I tried to argue that there is harmony and beauty in math.

In 1976 my school years were over, and I made the main choice in my life. I entered Kiev State University, where there was a variety of math-related disciplines, including mathematical analysis, flow chart and combinatorial theory, mathematical logic and algorithm theory, theory of queues, game theory, operations research, etc. I entered the department of cybernetics with specialization in mathematical economics. (My group consisted of approximately an equal number of men and women. There were groups with pure math specialization, and the proportion of men in such groups as usual was higher.) My family was not quite sure of my ability, but soon they understood that there were no causes for regret.

It seems to me that probability lies at the basis of our life. Moreover, there is a theory that concerns probability as a fifth dimension of the world (after 3-dimensional space and time). It is very interesting to investigate processes that include probability as an inherent feature of their existence, starting from dice games and coin tossing to more complicated phenomena. In economics it is connected with risk aversion in the decision-making process at any level of society.

That is why I chose stochastic optimization as the main field of my research interests. I studied for three years in the post-graduate program at Kiev State University and prepared a dissertation, "Planning of the development and allocation process on the basis of the stochastic optimization problems," which dealt with mathematical modelling of the decision-making process under uncertainty. Then I worked as a research associate in the Institute of Cybernetics of the Ukrainian Academy of Sciences. My work concerned both theoretical and applied analysis. I carried out a part of the important research project developing the national agricultural model and its links with a world market model of food and agricultural production. Also, my work dealt with statistical data processing of clinical inspections of the population after the Chernobyl catastrophe.

Now I am a student at the Central European University. I am interested in studying the basis of a market economy because our society is in transition and I do believe that my knowledge will be useful today. I am happy to devote my life to math. It helps me to put my mind and knowledge in order, to understand and analyze life.

Responding to our invitation, Larisa Leshchenko (Central European University, Prague) has contributed this autobiographical essay about her early interest in mathematics, her education and subsequent activities.
Any comments? Write to: AWM Education Committee, c/o Sally I. Lipsey, Chair, 70 E. 10th St., #3A, NY, NY 10003.

PENNINGTON VIDEO: The "Women in Math" video described in the last issue may be ordered directly from New Natives at 67 Leonard St., Suite One, Belmont, MA 02178; phone: (617) 484-1708. Individual copies are $49.95, and discounts are given for larger orders.

BOOK REVIEW

Two Generations of Feminist Thinking

Gender and Mathematics: An International Perspective. Edited by Leone Burton. New York: Cassell, 1990. xii + 162 pp. $29.95.

How can we expand the perspectives used to examine issues of gender and mathematics? Writings from a feminist viewpoint (e.g., Belenky, Clinchy, Goldberger & Tarule, 1986; Noddings, 1990) may be helpful in fostering this expansion. Belenky et al. studied adult women to understand "women's ways of knowing"; on the basis of their data they provide a provocative analysis of teaching and learning for women. They found that "connected teaching" (instruction that uses the "midwife" model rather than the more typical "banking" model [Freire, 1971]) facilitated the learning of women. Noddings has also critiqued research and practice in education from a feminist perspective. She discussed three generations of feminism.

> In the first generation, women seek equality with men; this is the typical liberal position. In the second, they embrace their own special qualities and reject uncritical assimilation into the male world; the emphasis here is on moving the best female qualities into the public world. In the third, women critique what they sought and accomplished in the first two phases and seek solutions that arise out of a careful synthesis of old and new questions. [Noddings, 1990, p. 393]

Nearly all of the research on gender and mathematics published since Fennema's [1974] early review of the literature fits in the first generation of feminist thinking. Typically this work has compared the mathematics achievement, ability, spatial skills, attitudes, or classroom experiences of female and male students. Most (but not all) of this first-generation work has been reported with a sensitivity to the pitfalls of comparing females to a standard based on the behavior of males. Second-generation research within the gender and mathematics literature has not been common. Work from this perspective focuses on the special contributions of women to mathematics (e.g., Perl, 1979) and approaches to teaching and learning mathematics that best fit women's "ways of knowing" [Belenky et al., 1986; Damarin, 1990]. I am not aware of work on gender and mathematics that represents the third generation of feminist thinking.

The book to be reviewed here is a collection of research and curriculum development efforts that were presented for the Women and Mathematics Topic Area at the Sixth International Congress on Mathematical Education (ICME-6) in Budapest, Hungary, in 1988. *Gender and Mathematics* is divided into four sections: Gender and Classroom Practice, Gender and Curriculum, Gender and Achievement, and Women's Presence. In this review, I will highlight some of the many viewpoints presented in this volume.

Leone Burton, editor of the volume and organizer of the group, has included a number of chapters in which gender and mathematics are viewed from a first-generation perspective; these chapters include interesting research results and a variety of approaches to research methodology. Hanna, Kundiger, and Larouche analyzed data from the Second International Mathematics Study (SIMS) for female and male students in the last grade of secondary school. The data came from 15 countries and included mathematics achievement for seven mathematical topics and various contextual variables. In all but three countries the mathematics achievement means for girls were significantly lower than the means for boys. For Thailand, British Columbia, and England there was no significant gender-related difference in mathematics achievement for 19 of the 21 comparisons. For Belgium, Finland, Israel, Japan, and Hungary there were statistically significant gender-related differences (up to 20 percentage points) in favor of boys for all but one of the seven mathematics topics. For the U.S. there were no significant gender differences for sets, algebra, number systems, and geometry; however, for finite mathematics, analysis, and probability there were significant differences, with boys obtaining higher scores than girls.

Hanna et al. explored reasons for the achievement results by contrasting the three countries where the boys and girls were equally successful (Thailand, British Columbia, and England) and the three countries where there was the greatest difference between the achievement of boys and girls (Israel, Japan, and Hungary). They found that in the

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countries where there was strong parental support for participation in mathematics by both boys and girls there were few gender-related differences in mathematics achievement, but in countries where there was less parental support for mathematical activities there were important gender-related differences. They found that the presence of gender-related differences was *not* related to the ratio of female to male mathematics teachers in the country, the stereotyping by students of mathematics as more suited for males than females, the number of years of postsecondary education the students anticipated, or the encouragement by parents to do well in school.

This study provides us with important information. The data indicate that gender-related differences in mathematics are present in some countries but not in others. This supports the notion that gender-related differences in mathematics achievement stem from sociocultural rather than biological factors. It will be crucial for data about sociocultural factors (such as student confidence in mathematics and student perceptions of the usefulness of mathematics) so further cross-country analyses can be done. In addition, gender analyses of the SIMS data for students at other age levels would be very helpful.

A study by Leder is another example of first-generation feminist research. She did a study in Australia of teachers' interactions with girls and boys during mathematics classes in Grades 3, 6, 7, and 10. She examined teacher-student interaction, wait time, and length of teacher-student interaction time for 292 girls and 289 boys in 26 classrooms. There was evidence of teacher bias in favor of boys for many categories of teacher-student interaction. However, there was no consistent pattern in favor of either girls or boys among the time variables.

In this study, Leder used a systematic observation system. The large sample size, wide range of grade levels, and the use of videotapes for analysis are all strengths of this study. Particularly, the use of videotapes allowed for a more detailed view of teacher-student interaction and clearer evidence of reliability than has been possible in many previous studies using systematic observation. In addition, Leder's examination of some new time variables (e.g., wait time, teacher attention time per exchange) is noteworthy.

Becker and Taylor both did qualitative studies that represent first-generation feminist thinking. Both studies involved in-depth interviews about educational and career choices for women and men who had pursued advanced graduate study. Both of these studies use life history interviews to examine complex sets of interacting experiences, attitudes, and beliefs. This is a promising methodology for mathematics educators.

A number of the chapters in *Gender and Mathematics* represent second-generation feminist thinking. The qualitative study by Rogers is a prime example. Rogers studied a successful college-level mathematics program at the State University of New York College at Potsdam (Potsdam College). This program has been recognized by the Mathematical Association of America because of the large number of mathematics majors (a majority of whom are women) it attracts and the variety and quality of the mathematics courses offered by the program. This study examined why this undergraduate program was so successful, particularly with women. Rogers conducted audiotaped interviews with 32 women and 8 men who were mathematics majors. In addition, she interviewed all of the faculty members in the mathematics department and selected staff members at the college in counseling, admissions, and administration. She also observed mathematics classes and office consultations between faculty and students...

Rogers had expected to find a teaching staff that was especially sensitive to issues of gender and mathematics and had taken special care to recruit and provide support for female students; she was surprised to find a staff of 14 male and 1 female instructors who were concerned about students in general. She found that teaching techniques were at the core of the success of the Potsdam mathematics program, especially for the female students. In describing the teaching typical of the program, Rogers highlighted one male mathematics instructor. This teacher worked with students so that they recreated the mathematics together. Students learned that they were able to reconstruct mathematical theories for themselves. Students played the role of expert and found confidence in their own ability to create mathematical ideas. Thus, all students, female and male, were supported through a teaching style "true to the nature of mathematical inquiry" [p. 45]. In addition, this teaching style appears to be congruent with the "midwife-teacher" described by Belenky et al. [1986, p. 217] and preferred by many women who were interviewed for *Women's Ways of Knowing*.

In this study a successful undergraduate mathematics program was studied in detail using qualitative methods. It is a promising approach to identify a mathematics program at any level of schooling from elementary through graduate school that is successful for women (or other groups who have traditionally been less successful in mathematics) and to study the program to understand why it is successful. A collection of such studies for a variety of groups in different societies would be helpful. In this way, a number of successful programs could be documented without losing the details of the specific social, political, and educational context of each program.

Three of the chapters in this collection report curriculum development projects. I think each of these represents second-generation feminist thinking. Verhage presents a major mathematics curriculum development effort in the Netherlands in which she has paid attention to issues of gender. The notion of developing mathematics curricula specifically for female students raises a number of provocative questions. Under what conditions might curricula designed for young women enable them to learn mathematics and see it as connected to their own needs, interests, and creativity? Under what conditions might curricula designed specifically for young women work to confirm the stereotypes that exist so subtly yet powerfully for women in many societies? What is the place of single-sex education in this complex set of issues? The chapter by Verhage deals with some of these questions in interesting ways, as do the chapters by Barnes and Coupland about calculus and by Marr and Helme about mathematics for adult women returning to school.

One of the interesting aspects of this collection of research and curriculum development efforts is the variety of perspectives represented (including a historical study of women and mathematics research by a group of Italian mathematics educators). The chapters cover most of the lifespan for women, from the elementary school to adulthood, in many different countries and cultures.

Certain themes that are central to research on gender and mathematics do not receive enough attention in this volume. None of the chapters provides a careful discussion of what is meant by equity and justice in mathematics. I refer readers who are interested in these issues to excellent recent writings by Secada [1989] and Fennema [1990]. The building of theory is another topic that does not receive sufficient coverage in this collection. What are the theoretical foundations of research on gender and mathematics? How does current research on gender and mathematics contribute to theories of teaching and learning mathematics? Closer attention to theoretical issues can enrich both the research studies we conduct and the conclusions we are able to draw from these studies.

The question of how gender interacts with race, culture, and social class receives little notice in *Gender and Mathematics*. One exception is in the chapter by Tressou-Milonas: she examined gender-related differences in three primary schools and found indications that social class was related to the direction of gender differences in mathematics performance. Research about the mathematics achievement and attitudes of young women from particular racial and cultural groups may be more helpful than attempts to make conclusions about women in general. In the past, conclusions about women in general have often been drawn from data about white women. It is not enough to examine the sexist orientations present in our societies without attention to issues of race and class.

In summary, this book gives us an international perspective on issues of gender and mathematics. It is not a comprehensive view of current research on this topic but may help us break out of our often narrow national focus. This volume also contains some glimpses of second-generation feminist thinking, an important step in expanding our perspectives on gender and mathematics.

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WEPAN CONFERENCE

The fourth annual Women in Engineering conference unites representatives of industry, education and government in a national effort to recruit women to engineering and help prepare for an increasingly global economy and multi-cultural workforce. The conference will be held May 23–25 at the Washington Marriott in Washington, D.C.

The conference is sponsored by WEPAN, a national coalition formed four years ago to provide women greater access to careers in engineering. WEPAN — the Women in Engineering Program Advocates Network — was launched by Purdue University, Stevens Institute of Technology and the University of Washington with funds from the National Science Foundation. The non-profit organization now has more than 375 members, including 70 corporate or institutional members.

Experts from the corporate, academic and public sectors will discuss successful strategies for increasing the low number of women in technical professions. Leaders of these three sectors recognize it is imperative to U.S. competitiveness to recruit more women and minorities to engineering. Participation from these traditionally underrepresented groups can help guarantee an ample supply of high-caliber, skilled technical professionals. It can also bring important new perspectives to the workplace. Among the issues to be covered are:

- Women in engineering programs. Directors of such programs from colleges and universities will discuss establishing, expanding and strengthening programs to recruit and retain women in technical fields. Fund raising strategies will also be discussed.

- Involving faculty in women in engineering programs. Engineering professors and deans of engineering schools will describe the role faculty may play in recruiting and retaining women students.

- Recruiting and retaining women technical professionals. Corporate representatives will share ways to keep women engineers in the field.

- Corporate partnerships. Models of successful industry-academic partnerships to cultivate women engineering students will be presented.

- Chilly climate issues. Representatives of industry and higher education will analyze the current corporate and academic climates for women in engineering.

- Innovative engineering curricula. Educators will present innovative curricula to encourage women engineering students and describe efforts to equip engineering students with the broad set of skills — both technical and interpersonal — now required to succeed in technical professions.

Keynote speakers include Susan Rosser, Ph.D., author of "Female Friendly Science," who will discuss curriculum and teaching techniques to attract and retain women in engineering and science. Rosser is director of Women's Studies and associate professor of family and preventative medicine at the University of South Carolina – Columbia.

Susan Wood, manager of systems and technical operations for the electronic systems group at Westinghouse Electric, will discuss steps to prepare for a global economy and a multi-cultural workforce. Lynn E. Bertuglia, P.E., chair of the National Society of Professional Engineers Task Force on Women and Engineering will discuss "Reflections on the Glass Ceiling: Are We Breaking Through?"

The conference will feature more than 40 speakers, including representatives from Alcoa, AAAS, Argonne, AT&T Foundation, NSF, NASA, the Research Triangle Science and Mathematics Alliance, Inc., Sandia Laboratories, Society of Women Engineers, Sun Microsystems and U.S. Department of Energy. Also presenting are directors of women in engineering and science programs, faculty and other representatives from colleges and universities, nationally and internationally.

The WEPAN conference has been a valuable educational event. In past years participants have left with useful plans of action, devised from a lively exchange of ideas, information and contacts.

For more information, contact Susan Staffin Metz, WEPAN Conference Chair and Director, Office of Women's Programs, Stevens Institute of Technology, Castle Point on the Hudson, Hoboken, N.J., 07030; phone: (201) 216-5245.

GENDER, MATHEMATICS, AND SCIENCE (part 1 of 2)

Males have greater access to science and technical fields and greater earning power than females. Many argue that cognitive and psychosocial gender differences explain these career differences. In contrast, evidence from meta-analysis and process analysis indicate that (a) gender differences on cognitive and psychosocial tasks are small and declining, (b) gender differences are not general but specific to cultural and situational contexts, (c) gender differences in cognitive processes often reflect gender differences in course enrollment and training, and (d) gender differences in height, physical strength, career access, and earning power are much larger and more stable than gender differences on cognitive and psychosocial tasks. These trends imply that small gender differences in cognitive and psychosocial domains be de-emphasized and instead that learning and earning environments be redesigned to promote gender equity.

Women are dramatically underrepresented on university science and mathematics faculties and in technical careers, even in relation to the numbers of women trained in graduate programs [Koshland, 1988]. Many explain the underrepresentation of women in mathematics and science on the basis of gender differences in cognitive and psychosocial tasks. In contrast, mounting evidence from meta-analysis, a technique for research synthesis, combined with process analysis, a technique for characterizing the cognitive skills used in complex tasks, suggests that these differences were always small, that they have declined in the last two decades, that differences arise in some contexts but not in others, and that educational programs can influence when differences arise. During the time that gender differences in cognitive and psychosocial domains have diminished, earning power for females compared with males remains unchanged, with females averaging 59% of males' salaries. Female access to mathematics and science careers has increased but has remained low, going from 8.6% female in 1975 to 13.4% female in 1986 [National Science Board, 1987]. In this paper, we summarize trends in cognitive, psychosocial, and physical gender differences and argue that explanations for gender differences in earning power and career access lie in interactions among factors within societal control.

Research Synthesis

We use meta-analysis, a powerful tool for synthesizing results from studies of gender differences and analyzing the influence of moderator variables, to characterize these trends. Current meta-analyses use the statistic *d* [Cohen, 1969; Glass, McGaw, & Smith, 1981; Hedges & Olkin, 1985], computed as the difference between the female mean and the male mean, divided by the pooled within-group standard deviation. The measure *d*, often referred to as the "effect size," indicates how far apart the group means are in standard deviation units. In this article, we will follow the convention that positive values reflect higher female scores and negative values reflect higher male scores.

In conducting a meta-analysis, researchers cumulate *d* over many studies. Using corrections devised by Hedges [1982a, 1982b], *d* values can be used to estimate population values. In addition, because *d* values often vary substantially from one study to the next, techniques following the traditional analysis of variance and regression approaches permit investigators to determine whether variations in values of *d* arise from random sampling variation or systematic effects [Hedges, 1982a, 1982b]. If systematic effects exist, then investigators can partition the studies on the basis of variables that might have contributed to the heterogeneity and test whether the studies grouped together have homogeneous values of *d*.

The technique of process analysis is one method that has guided researchers in partitioning studies of gender differences systematically by subdividing the studies into groups that require the same solution strategies (e.g., Linn & Petersen, 1985). Mathematics tests might be partitioned on the basis of whether the problems require rapid computation or selection of an effective algorithm. By combining

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meta-analysis and process analysis, we can gain systematic understanding of gender differences hypothesized to contribute to differential access to scientific careers.

Gender Differences in Cognitive Abilities

Many assert that gender differences in cognitive abilities explain differential career access. In 1974, Maccoby and Jacklin, in a landmark analysis, concluded that gender differences existed for (a) verbal ability, (b) quantitative ability, and (c) spatial ability. Since 1974, however, gender differences in these areas have declined, meta-analyses have shown that differences are *not* uniform within these categories, and process analyses have yielded more specific descriptions of areas where differences arise.

Verbal Ability

Hyde and Linn [1988] recently synthesized research on gender differences in verbal ability. They found an average d = .11, and concluded that such differences no longer exist (see Figure 1). Since the values of d were not homogeneous, Hyde and Linn partitioned the studies by type of test, age of subjects, cognitive process, and date of study. They reported no systematic variation with age and found that the cognitive process analysis came closest to dividing the studies into homogeneous groups. Furthermore, the combined d for studies conducted since 1974 was .10, compared with a combined d of .24 for those conducted before 1974. These findings led Hyde and Linn to conclude that differences in verbal ability have declined essentially to zero.

Several investigations support this conclusion. Feingold [1988] reported similar declines on tests given to national samples (see Figure 1). Rosenthal and Rubin [1982] documented a decline in gender differences using studies published between 1966 and 1973 for three cognitive skills. They computed correlations between recency of publication and degree of female superiority. The correlations, all significant, were -.29 for verbal ability, .21 for quantitative ability, and .46 for visual-spatial ability.

For the voluntary group of students taking the Scholastic Aptitude Test – Verbal (SAT-V), change has been greater than for other tests and recently resulted in d = -.11, slightly favoring males. Compared with national samples, the voluntary SAT-V sample is unusual: More females than males take the SAT-V, the females have less academic preparation, come overall from a lower socioeconomic group, and have a lower level of parental education than males [Ramist & Arbeiter, 1986]. In addition, process analysis reveals that females outperform males on questions in which the verbal content is about aesthetics, whereas males excel when the content focuses on questions regarding science and practical affairs. When these factors are considered, the Educational Testing Service reports that the gender differences on the SAT-V are reduced to d = -.02 [Burton & Lewis, 1988]. Overall, studies of gender differences in verbal ability support the conclusion that these differences are now negligible and therefore cannot contribute to differential career access.

Figure 1: Cognitive Gender Differences

Verbal		
Overall[1]		.11
1973 or earlier[1]		.23
1974 or later[1]		.10
PSAT - Verbal Norms[2]	1960	.12
	1980	-.02
SAT-V Volunteers[2]	1967	.05
	1983	-.11
Spatial		
Spatial Visualization before 1974[3]		-.30
Spatial Visualization after 1974[4]		-.13
DAT - Spatial Relations[2]	1947	-.37
	1980	-.15
Mental Rotations[4]		-.73
Mathematical		
Mathematical before 1974[5]		-.31
Mathematical after 1974		-.14
DAT - Numerical[2]	1947	-.21
	1980	.10
NAEP[6] 9-year-olds	1978	.08
	1982	.12
	1986	.00
NAEP 13-year-olds	1978	.03
	1982	-.04
	1986	-.07
NAEP 17-year-olds	1978	-.22
	1982	-.20
	1986	-.18
PSAT - Quantitative Norms[2]	1960	-.49
	1983	-.12
SAT Voluntary Sample	1960	-.50
	1983	-.42

1: Hyde & Linn, in press; 2: Feingold, 1988; 3: Hyde, 1981;
4: Linn & Petersen, 1985; 5: Hyde, Fennema, & Lamon, in press;
6: Dossey, Mullis, Linquist, & Chambers, 1988

Spatial Ability

Many assert that gender differences in spatial ability contribute to gender differences in science and mathematics performance, although only correlational evidence for this hypothesis is available. Meta-analyses of gender differences in spatial abilities provide no evidence for the hypothesis and, instead, reveal that (a) gender differences occur on spatial processes not obviously related to science or mathematics, (b) gender differences in spatial ability are declining, and (c) processes revealing gender differences in spatial ability respond to training.

Definitions of spatial ability range from such diverse tasks as locating a single figure within a complex figure to mentally rotating an object as rapidly as possible. Spatial visualization requiring the process of reasoning about spatially presented information has been most closely associated with mathematics and science performance [Fennema & Sherman, 1979]. In their meta-analysis of spatial ability gender differences, Linn & Petersen [1985] partitioned studies into spatial process including spatial visualization and mental rotations.

Synthesis of spatial visualization studies before 1974 yielded d = -.30 [Hyde, 1981], whereas studies subsequent to 1974 yield d = -.13 [Linn & Petersen, 1985], leading Linn and Petersen to conclude that gender differences on this dimension no longer exist. Recent analyses of moving data from the Differential Aptitude Test – Spatial Relations tests (see Figure 1) corroborate this finding [Feingold, 1988], as do correlations between d and recency of publication [Rosenthal & Rubin, 1982].

In contrast, Linn and Petersen [1985] found large heterogeneous differences on mental rotation requiring the process of rapidly rotating a figure through space. On this task, gender differences occur on speed, but not on accuracy [Kail, Carter, & Pellegrino, 1979]. The heterogeneity of these effects reflects, in part, the responsiveness of mental rotation skill to training. Training tends to reduce or eliminate gender differences on mental rotations [Lohman, 1988]. Thus, even if this skill were found to contribute to mathematics and science performance, gender differences could be reduced through training.

Thus, gender differences in spatial ability are heterogeneous and declining. Differences that remain are responsive to training and have been hypothesized to arise from differential participation in athletics (e.g., Newcombe & Baenninger, in press). As discussed subsequently, these declines in gender differences in spatial ability accompany increases in female participation and success in athletics.

Quantitative Ability

Trends in gender differences in quantitative ability parallel those for other cognitive abilities. In particular, (a) average quantitative gender differences have declined to essentially zero, (b) age trends indicate that females are superior at computation at all ages and that differences favoring males on problem-solving emerge in high school, (c) process analyses reveal that gender differences arise among high school students on items involving sports and science, and on complex applications, (d) the voluntary Scholastic Aptitude Test – Mathematics (SAT-M) sample registers larger differences than nationally representative samples, and (e) during high school, more males than females participate in advanced courses covering complex mathematical applications. Hyde, Fennema, and Lamon [in press] recently synthesized gender differences in quantitative ability and found an average effect size of +.05 for studies of the general population, indicating slight female superiority. They report that the magnitude of the gender difference has declined since 1974 (see Figure 1), that there are no differences on computation and mathematical concepts and that differences favoring males emerge on problem-solving tests in high school (d = -.29) and college (d = -.32) and are largest for highly selective samples (d = -.54). They conclude that the SAT-M quantitative scale has idiosyncratic gender differences as compared with other tests of quantitative ability. They also note that their results for selective samples shed light on the large gender differences reputed in Benbow and Stanley's [1980] study of precocious youth. Often, secondary reports about these students fail to indicate that these are specialized samples. The Hyde et al. [in press] empirical results demonstrate that results from such specialized groups do not generalize to the rest of the population.

Data from the National Assessment of Educational Progress (NAEP), Differential Aptitude Test (DAT) national norming groups, and Preliminary Scholastic Aptitude Test – Mathematics (PSAT-M) similarly indicate declines over the last two decades in gender differences in quantitative tasks (Dossey, Mullis, Lindquist, & Chambers, 1988; Feingold,

1988; see Figure 1). These data sets are consistent with Hyde et al. [in press] in showing that the largest differences arise on tests of complex applications given to adolescents. Before 1974, many studies revealed *d*'s of -.4 to -.5 for adolescents, whereas recent national studies uniformly reveal effects of about *d* = -.15 [Hyde, 1981; Hyde et al.].

Furthermore, gender differences are not homogeneous across test questions [Burton & Lewis, 1988; Chipman, 1988; McCarthy, 1976; Meehan, 1984]. Generally, males perform better than females on applications of mathematics to measurement, sports, and science, whereas females outperform males on applications to aesthetics, interpersonal relationships, and traditionally female tasks, such as typing and sewing. As a result, it is possible to eliminate or exaggerate gender differences by selecting test questions with contexts favoring males or females.

Context effects on mathematics and science items reflect high school enrollment patterns and beliefs of males and females. Overall, only 40% of American students take a second year of algebra, 48% of 11th graders believe that learning mathematics is mostly memorizing, and 81% believe that there is always a rule to follow in mathematics [National Science Board, 1987]. Nationally, females in precalculus and calculus constituted 36% of the students in 1978, 45% in 1982, and 39% in 1986 [National Science Board]. In California, females constituted 41% of the calculus students in 1983, 42% in 1987, and 41% in 1988 [Zimmerer & Bennett, 1987]. In California high schools from 1983 to 1987, females constituted 38% of physics students, 34% of advanced physics students, and 42% of chemistry students [Zimmerer & Bennett]. Thus, the largest gender differences in quantitative ability are found for high school students on problem-solving items and are similar in magnitude to the gender differences in enrollment in advanced courses that also emphasize solving word problems.

Given the declines in gender differences on most national assessments, the large, consistent gender differences found for the voluntary SAT-M sample are anomalous. As mentioned for SAT-V, this is due in part to the increasing numbers of female volunteers who are less prepared than male volunteers. In addition, these differences arise because males outperform females on items from science and sports, although the developers of the test are now removing items that have such bias. Nevertheless, the large differences in the proportion of those earning extremely high scores require further scrutiny. For the June 1981 and May 1982 administrations of the SAT-M, 96% of the individuals earning the highest score (800) were male [Dorans & Livingston, 1987].

Figure 2: Example Item from the 1986 SAT-M

Question:

21. A high school basketball team has won 40 percent of its first 15 games. Beginning with the sixteenth game, how many games in a row does the team now have to win in order to have a 55 percent winning record?

(A) 3
(B) 5
(C) 6
(D) 11
(E) 15

Algebraic Solution:

.4(15) + 1.0(GamesToWin) = .55(15 + GamesToWin)

6 + GamesToWin = .55(15) + .55(GamesToWin)

GamesToWin - .55(GamesToWin) = 8.25 - 6

.45(GamesToWin) = 2.25

GamesToWin = 5

Why do so few women earn very high scores on the SAT-M? The processes required for earning very high scores on the SAT include ability to solve word problems quickly, and males may have an advantage in speed. One popular SAT review course claims to raise overall scores 150 points by teaching students to make rapid, intelligent guesses rather than to engage in lengthy computations [Robinson & Katzman, 1986]. Analysis of an item from the 1986 SAT-M with the largest discrepancy between males and females illustrates the issues. This item (Figure 2) involves sports, a topic more familiar to males, and has at least three distinct options for solution. First, one can set up an algebraic formula, as shown in Figure 2, but this approach might take more time than is available. Second, one can apply prior experience with seasonal averages and immediately report as one respondent did, "Well, they used easy numbers. I already know that 11 out of 20 is a 55% winning record, and that makes 5 the right answer here." Third, as another respondent did, one can work backwards from the answers, reasoning, "Well, 3 probably isn't enough. I think I'll try 5. Oh, that works." Examination of a variety of items suggests that an important skill on the SAT-M is the ability to select a strategy that can be applied quickly and accurately to the problem. If, in addition, SAT-M items can be solved by strategies learned

from gender-typed activities, differences in excess of these found for other mathematics assessments may arise. Furthermore, examination of precollege mathematics textbooks reveals that students taking algebra and geometry would learn the algebraic solution to this problem, and would not be encouraged to take "shortcuts" or to reason backwards from the answers. In some classes students would be required to "show their work" and would be penalized if they used a more intuitive approach. As discussed for the psychosocial domain below, females may be more likely than males to use the techniques they learned in school.

In summary, gender differences in quantitative ability are declining for most measures, but remain for the SAT-M. Because the SAT-M reveals differences not detected in other assessments, caution should be used in interpreting scores on this test. The processes that result in superior performance need clarification, and the instruction appropriate for these processes may need greater emphasis.

Science

Gender differences in science knowledge and scientific reasoning reflect both formal and informal learning experiences. Overall gender differences in science (a) are larger for science knowledge than for science processes, (b) are declining among high school students, and (c) accompany gender differences in formal and informal learning experiences. When science processes are separated from science knowledge, gender differences occur only on knowledge [Hueftle, Rakow, & Welch, 1983; Zimmerer & Bennett, 1987]. When both are combined, males outperform females, especially in physical science. The trend is for declining differences among 17-year-olds on analyzing scientific problems and data (d = -.64 in 1982 and d = -.40 in 1986), but is stable for 9- and 13-year-olds [Mullis & Jenkins, 1988]. Fewer females than males take chemistry and physics, but in a recent national study, course enrollment had no effect on the magnitude of the gender difference [Mullis & Jenkins]. On balance, males compared with females report substantially more informal experience with physical science. By 11th grade, 49% of males compared with 17% of females report use of an electricity meter (d = -.95).

Other Cognitive Skills

The trend toward declining gender differences emerges even in areas where gender differences persist. For example, for grammar and mechanical reasoning, differences have declined since 1947, but in 1980 females excelled in grammar (d = .40) and males excelled in mechanical reasoning (d = -.76) [Feingold, 1988].

Summary

In summary, cognitive gender differences have declined in all areas studied and no longer exist for verbal ability, spatial visualization, and mathematics computation and concepts. Differences for mental rotations decline with training. Differences remain for high scores on SAT-M and for advanced mathematics and science topics studied more by one sex than the other. Gender differences in career access in mathematics and science are much larger than any found in cognitive skills. What about psychosocial gender differences?

Psychosocial Gender Differences

Gender differences in aggression and confidence may contribute to differential career access and earning power. Recent meta-analyses of psychosocial gender differences have demonstrated that differences are (a) heterogeneous, interacting with situational and cultural factors, and (b) declining in some areas and increasing, perhaps as the result of changing social roles, in others.

Aggression

Gender differences in aggression are well established, subject to situational influences, and declining. Using a large sample of studies, Hyde [1984, 1986] conducted a developmental meta-analysis. The weighted mean effect size was d = -.50, and gender differences in aggression were larger for children (d = -.64) than for adults (d = -.29). Eagly and Steffen [1986] meta-analyzed studies of adult (mostly college-age) subjects to test various predictions deriving from social role theory. They found that the tendency for men to show aggression more than women was larger in laboratory settings (d = -.35) than in field settings (d = -.21). Further, the gender difference in physical aggression (d = -.40) was significantly larger than the gender difference in psychological aggression (d = -.18), and females were more likely to feel guilt and concern about possible harm to others in aggressive situations than were males. Although the heterogeneity of gender differences in aggression interferes with efforts to

determine changes over time, Hyde [1984], using all studies, found d = -.53 for studies published from 1966 to 1973 and d = -.41 for studies published between 1978 and 1981, whereas Eagly and Steffen [1986], using studies of adults, found no relationship between year of publication and magnitude of gender difference.

Gender differences in aggression are generally larger than gender differences in the cognitive domain and may contribute to male success in careers and in earning power. Teachers may pay more attention to male students because they aggressively seek information, providing these students with additional feedback, encouragement, and opportunities for practice [Dweck, 1986]. Furthermore, in some fields, aggressive argumentation is taken as a sign of intelligence rather than as a gender-related behavior. Finally, aggressive behavior on the part of males may interact with gender differences in confidence to deter females from pursuing scientific careers and thus from securing increased salaries.

Confidence

The greater confidence of males compared with females concerning their abilities in mathematics and science [California Basic Education Data System, 1985; Dossey et al., 1988] (a) arises even when gender groups perform equally, (b) emerges in high school, and (c) coincides with differences in enrollment in advanced courses, with differences in interest in science and mathematics, and with differences in access to careers in mathematics and science. In the elementary years, males and females report equal confidence in their mathematics ability, but by high school males are far more confident than females [Eccles, 1984]. In mathematics, national studies consistently report that, among high school students, fewer females than males consider themselves "good at mathematics" [Dossey et al., 1988]. For 17-year-olds, there has been an overall increase in confidence by both sexes in the last two decades, but the "confidence gap" between males and females remains large. In 1978, 49% of females and 59% of males reported that they were good at mathematics (d = -.27). In 1982 it was 53% of the females and 63% of the males (d = -.27), and in 1986 it was 55% of the females and 66% of the males (d = -.29) [Dossey et al.].

In science, a survey of all eighth graders in California revealed that 39% of the boys and 12% of the girls (d = -.92) believe that boys understand science better than girls, and that 19% of the boys compared with 13% of the girls (d = -.26) believe that studying science is more important for boys than for girls [Zimmerer & Bennett, 1987]. Males also report more positive attitudes toward science. In the 11th grade, 50% of the males compared with 42% of the females (d = -.20) report that they will use science in many ways when they are adults [Mullis & Jenkins, 1988]. Analysis of the processes contributing to differences in confidence reveal that, even when the two groups perform equally, males overestimate their abilities and females are realistic [Linn, 1986].

The greater confidence of males in mathematics and science may well reflect the greater representation of males in careers in these fields and no doubt serves to perpetuate the situation. Furthermore, confident students are more likely to try alternative approaches for problem solutions, to experiment with techniques not taught in class rather than carefully following school procedures, and to persist in mathematics and science courses.

Interest

Researchers have examined the interests of males and females in (a) science and mathematics activities such as reading articles about new procedures, (b) careers in science, mathematics, or engineering, and (c) using mathematics or science knowledge in their life activities. Overall, these investigations suggest that (a) there are no gender differences in interests in the elementary years but by the end of high school males are more interested in mathematics and science than are females (e.g., Dossey et al., 1988; Eccles, 1984; Eccles, Adler, & Meece, 1984; Hilton & Berglund, 1974; National Science Board, 1987), (b) these gender differences have remained large over the past ten years [Grandy, 1987] and (c) of the three categories of interest, only the perceived usefulness of mathematics and science seems to influence persistence in courses (e.g., Eccles). For example, males and females of elementary age report equal interest in careers in mathematics and science, yet at the end of high school about 40% of college-bound males as compared with 20% of college-bound females report such interests [Grandy].

The gender differences in perceived utility of mathematics and science during the high school years may interact with the frequently reported concern that the high school curriculum does not

address topics or problems relevant to the students. This interaction may contribute to differential enrollment in mathematics and science courses. Mathematics problems concerning the relative speeds of trains leaving Chicago and New York, science courses that fleetingly cover so much information that the only available learning strategy is to memorize rapidly and to forget quickly, and curricula that focus on frictionless universes or esoteric problems are unlikely to seem useful to students (e.g., Linn, 1987; National Council of Teachers of Mathematics, 1989). As a result it is not surprising that females excel at computation, because its usefulness is readily apparent, or that students making decisions on the basis of perceived utility avoid current physics and chemistry courses. To serve the needs of all students and to increase the societal knowledge of mathematics and science, it seems advantageous to increase the relevance of these courses and to ensure that students learn how to think about everyday problems rather than just problems easily explored in controlled laboratory experiments.

The emergence of gender differences in confidence in mathematics and science and in interest in mathematics and science during the high school years may coincide with increases in awareness of societal expectations of roles for males and females. These perceived role differences may also become more predominant in the experiences of males and females as they interact in mixed sex groups. In the future, the increased visibility of both males and females in nontraditional occupations may serve to reduce differences in confidence and interest.

Social Influence

Many believe that females are more suggestible than males. Research shows that gender differences in social influence [Eagly, 1978, 1986; Eagly & Carli, 1981] depend on situational factors, are small overall (persuasion, d = .16; group pressure, d = .32), and are declining. A slight propensity to respond to group views may lead females to be more likely to conform to classroom requirements. Furthermore, responsiveness to opinions of the group may be more adaptive in collaborative rather than competitive learning environments.

Helping Others

Many believe that females are more altruistic and nurturant than males, although evidence suggests these effects are situational [Maccoby & Jacklin, 1974]. Looking at the narrower question of the extent to which males and females give and receive help, meta-analysis shows an overall d = -.34 and demonstrates that males help when it is consistent with the male role, such as when there is potential danger involved in helping, or when helping is not requested (d = -.55). In contrast, females help when it is consistent with the female role and do not help when there are others who could help instead (d = -.42) [Eagly, 1978; Eagly & Carli, 1981]. The propensity of females to defer to others when help is needed and to help only when asked is consistent with the female role. Because mathematics and science are seen as male domains, it follows that males are more likely to help in these areas and perhaps to learn more themselves as a result of teaching mathematics or science to others.

Implications of Psychosocial Differences

Gender differences in the psychosocial realm may interact with mathematics and science performance to influence both persistence and career success. For example, the confidence gap between males and females may be sufficient to dissuade females from taking shortcuts on assessments such as the SAT, and societal perceptions of mathematics and science as male domains may reflect the aggressive style sometimes found in these fields. These factors may interact with the confidence gap to channel females into the less glamorous and more routine mathematics and science activities and may be a decisive factor in the precipitous drop in female persistence at the postdoctoral level [Koshland, 1988].

QUERY: TEACHING EVALUATIONS

An assistant professor at a small liberal arts college, up for tenure next year, has evaluations that are good compared to male colleagues' except for a few very negative ratings which she has received from hostile male students. She needs hard evidence that students evaluate male and female instructors differently. We'll send her a copy of Neal Koblitz's article. If anyone knows of any other studies, please forward them to the AWM office, and we'll pass them along.

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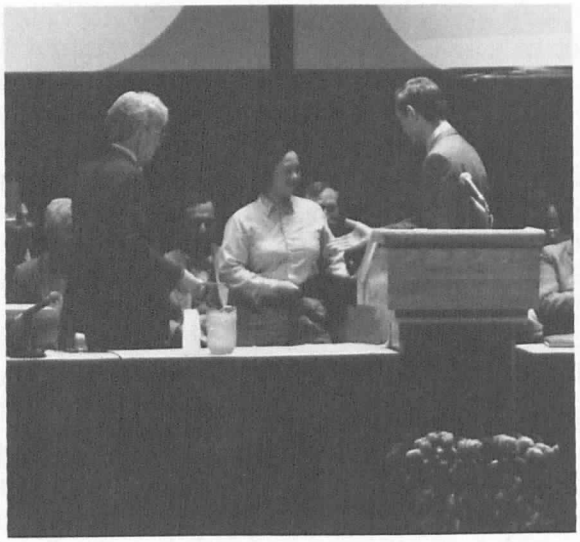
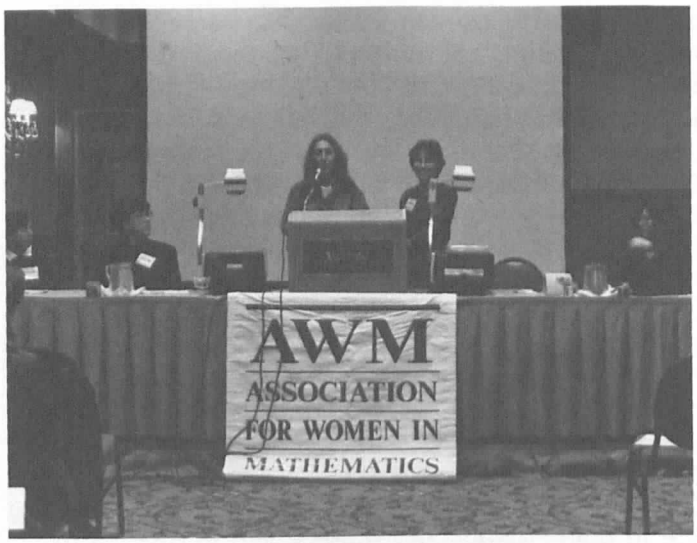


Robert Fossum, Lai-Sang Young, and Michael Artin
Presentation of Satter Prize



Carolyn Gordon, Deborah Lockhart, Cora Sadosky,
Ruth Charney, and Lenore Blum at the Workshop

Chandler Davis, David Webb, Carolyn Gordon, Lee Lorch,
and Cora Sadosky at the Workshop

Carol Wood, Cora Sadosky, and Linda Keen
at Linda's Noether Lecture

AWM RECEPTION

Linda Keen, Richard Herman, and Cora Sadosky

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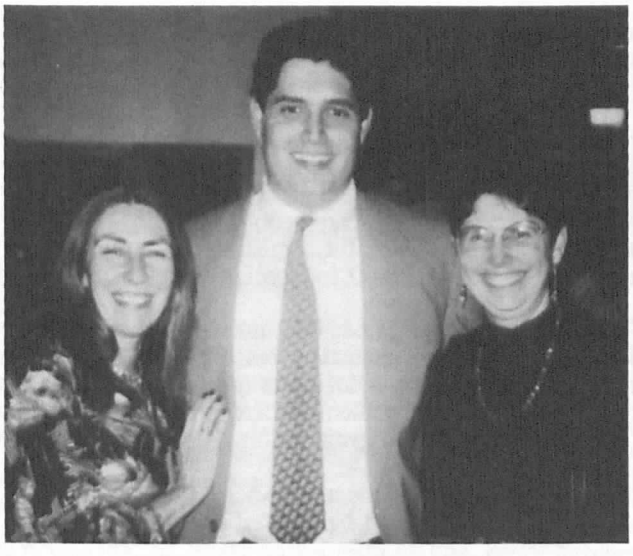

Cora Sadosky, Seth Green, and Judy Green

Mary Gray and Alice T. Schafer

The College of Computer, Mathematical,
and Physical Sciences
and the Department of Mathematics
cordially invite you
to a Welcoming Reception for the

Association for Women in Mathematics

to celebrate the relocation of their offices
to the University of Maryland at College Park

Thursday, March 25, 1993
4:30 to 6:00 P.M.
The Rotunda, The Mathematics Building
The University of Maryland at College Park

R.S.V.P. By March 19
Math Department 301-405-5048

NSF-AWM TRAVEL GRANTS FOR WOMEN

The objective of the NSF-AWM Travel Grants 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. International travel must be on U.S. flag carriers.

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 many 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, such as a regular NSF grant, is ineligible. Partial institutional support does not however make the applicant ineligible.

Target Dates. There will be three award periods per year, with applications due February 1, May 1 and October 1. 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, to: Ginny Reinhart, Executive Director, Association for Women in Mathematics, 4114 Computer & Space Sciences Building, University of Maryland, College Park, MD 20742-2461; (301) 405-7892.

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INDIANA UNIVERSITY/PURDUE UNIVERSITY AT INDIANAPOLIS IN COLUMBUS (IUPUI COLUMBUS) - Tenure track position in mathematics in the Purdue University School of Science at IUPUI Columbus. Rank and salary dependent upon qualifications. Candidate must demonstrate excellence in teaching undergraduates and research. Duties include teaching undergraduate mathematics classes that support the academic programs at IUPUI Columbus. Candidates should have a Ph.D. and a record of scholarly activities together with evidence of an active program of current research. A minimum of three years of university teaching experience is required. Applications postmarked by May 31, 1993 will be considered first. Review of applications will continue until the position is filled. Please send application, resume, and three letters of recommendation to: Dr. Paul Bippen, Director, IUPUI Columbus, 4601 Central Avenue, Columbus, IN 47203. IUPUI Columbus is an Affirmative Action/Equal Opportunity Employer. Women and minority candidates are encouraged to apply.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (M.I.T.) - DEPARTMENT OF MATHEMATICS - The Department of Mathematics may make appointments at the assistant professor and higher levels in pure and applied mathematics. The teaching load will be six hours per week in one semester and three hours per week in the other, or other combinations totaling nine hours. Open to individuals with doctorates who have shown definite leadership in mathematical research. Applicants please send vita and selected publications to: The Pure or Applied Mathematics Committee, Massachusetts Institute of Technology, Room 2-236, Cambridge, MA 02139-4307. M.I.T. is an Affirmative Action/Equal Opportunity Employer.

MCGILL UNIVERSITY - DEPARTMENT OF MATHEMATICS AND STATISTICS - The Department of Mathematics and Statistics at McGill invites applications for nomination for the Natural Sciences and Engineering Research Council of Canada (NSERC) Women's Faculty Award in 1994-95. Successful candidates will be appointed to an Assistant Professor level position with a light teaching load and emphasis on research, tenable for five years beginning in the summer of 1994. NSERC encourages Universities to offer tenure track positions to holders of the award as such positions become available. Candidates should have a Ph.D. degree and should show strong potential in teaching and research. Applications are invited from specialists in any area of Mathematics and Statistics. NRERC has targeted these awards for women, who also must be Canadian citizens or permanent residents by October 15, 1993. Further information on the award can be obtained from the Department or directly from NSERC. Candidates should submit a curriculum vitae and arrange for three letters of reference to be sent by August 31, 1993 to: K. Peter Russell, Chair, Department of Mathematics and Statistics, McGill University, 805 Sherbrooke Street West, Montreal, Quebec, Canada H3A 2K6.

NORTHERN MICHIGAN UNIVERSITY - The Mathematics and Computer Science Department invites applications for three one-year appointment for the 1993-94 academic year, with the expectation that at least one will be a tenure-track position. Appointments may be made at either the instructor or assistant professor levels. A Ph.D. is required for appointment as an assistant professor. The Department offers undergraduate degrees in mathematics, mathematics education and computer science, in addition to meeting a large service role. We are particularly interested in attracting persons who have a commitment to excellence in teaching and a preparation in an applied branch of mathematics or in computer science. In recent years NMU has established a goal of ethnic and cultural diversity as a major, ongoing priority of the University and is hence seeking a diverse applicant pool in this search. We strongly encourage women, minorities and others to apply who may contribute to this diversity and who generally meet the basic qualifications of the position. Applicants should send a resume, transcript and three letters of recommendation to: Dr. Terrance L. Seethoff, Department Head, Mathematics and Computer Science Department, Northern Michigan University, Marquette, MI 49855-5340. Applicant screening begins April 15, 1993. Applicants will be considered until the positions are filled. Northern Michigan University is an Affirmative Action/Equal Opportunity Employer.

UNIVERSITY OF IOWA - Mathematics Education - The University of Iowa's Division of Curriculum and Instruction is seeking applicants for a one-year visiting assistant professor in mathematics education. The responsibilities of the position include teaching three courses per year from among the elementary or secondary mathematics teacher preparation courses, advising undergraduate students, and working on an externally-funded curriculum project. Candidates should hold a Ph.D. in mathematics education or equivalent program; have successful teaching experience at either the elementary or secondary school level, have strong preparation in mathematics, and have a commitment to excellence in teaching. Applications will be reviewed beginning April 15, 1993, and continue until the position is filled. Send letter of application, vita, transcripts, and three letters of recommendation to: Mathematics Education Search Committee, c/o Dr. Harold L. Schoen, Division of Curriculum and Instruction, 259 Lindquist Center, North, The University of Iowa, Iowa City, IA 52242-1529. The University of Iowa is an Affirmative Action/Equal Opportunity Employer. We are especially interested in receiving applications from women and minorities.

UNIVERSITY OF MINNESOTA - GEOMETRY CENTER - DIRECTOR OF TECHNOLOGY - The Geometry Center is the National Science and Technology Research Center for Computation and Visualization of Geometric Structures. Its mission includes research, communication and education, with software and tool development in support. The program is centered on mathematics, and built on computing and visualization. The Center occupies about 15,000 square feet of space overlooking the Mississippi and the downtown Minneapolis skyline. The Center is searching for a director for its graphics and software development program. This Director of Technology will report to the Center's director in consultation with its executive committee. Currently there are 10 full time technical staff who develop mathematics and graphics software, participate in communication and educational activities, and consult with and assist visitors in such activities. The technical staff will report to the Technical Director who will also work closely with the faculty and associates of the Center. It is expected that the Technical Director will become a leader in the national and international mathematical communities in promoting these activities and managing the gamut of technical issues that surround them. The technical issues include interconnectivity of software, integration with existing tools, specifications of new tools for math computing and visualization, creation of a model environment for experimental mathematics and, not least, dissemination of information to the math community and scientific public. In promoting these activities, the Technical Director will be expected to maintain contact with appropriate people in other, related, Science and Technology Centers, and in the computer graphics and experimental mathematics communities in general. Minimum requirements are a Ph.D., at least five years experiences in corporate, government, or academic research labs, and a high level of communication and interpersonal skills. A substantial record of accomplishment in computer graphics and/or large scale scientific software development will be expected. Salary will be competitive. For further information, please contact Dr. Wilks as below. To apply, please send in confidence before July 31, 1993 your resume and names of three references who know your work well to: Dr. Allan Wilks, Chair, Center Search Committee, AT&T Bell Laboratories, 600 Mountain Avenue, Room 2C-283, Murray Hill, NJ 07974, E-mail: wilks@geom.umn.edu, Phone: (908) 582-4550, Fax: (908) 582-3340. The University of Minnesota is an Equal Opportunity Educator and Employer.

UNIVERSITY OF MINNESOTA, DULUTH - TEMPORARY ASSISTANT PROFESSORS/INSTRUCTORS - 9/1/93-5/31/94 - Teach up to three mathematics and/or statistics courses per quarter. Full course administrative responsibilities and additional faculty duties such as advising, service, research, and participation in departmental curricular decisions. Competitive salary. Required: demonstrated evidence of teaching excellence and communication skills appropriate to a full-time faculty position; degree in Mathematics or Statistics by 5/27/93 (Master's for Instructor, Doctoral for Assistant Professor); at least one year's experience teaching college/university courses. Send letter of application, resume, three letters of recommendation, and official transcript of highest degree received or in progress to: Dr. Kang James, Search Committee Chair; Math and Statistics, HH 108; University of Minnesota, Duluth; 10 University Drive; Duluth, MN 55812 by May 27, 1993. The University of Minnesota is an Equal Opportunity Educator and Employer.

UNIVERSITY OF NEW HAMPSHIRE - The University of New Hampshire Math Department invites applications for a 3 year position as Chair beginning Summer 1993; renewal is possible but not expected. Ph.D. in mathematical sciences required with accomplishment in scholarship and teaching, administrative leadership desired. Send resume and three references to: Donovan Van Osdol, Chairman, University of New Hampshire, Department of Math, M312 Kingsbury Hall, Durham, NH 03824. Application review begins 4/28/93. Women and minorities encouraged to apply. The University of New Hampshire is an Affirmative Action/Equal Opportunity Employer.

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ASSOCIATION FOR WOMEN IN MATHEMATICS

Institutional Membership

Date_____ 19____

Please fill out this application and return it as soon as possible. Your institution will be updated on our membership list upon receipt of the completed application and payment of member dues or receipt of postal order. See below to determine which membership category you wish to choose. Subscription to the AWM Newsletter is included as part of the membership. Institutional members receive two free advertisements in our newsletter per year. All institutions advertising in the AWM Newsletter are Affirmative Action/Equal Opportunity Employers.

Indicate below how your institution should appear in the AWM Membership List.

_____

_____

_____

_____

Are you a new member?_____ Is this an address change?_____

Department Telephone Number: _____

Chair: _____

Last name First Middle Initial

Telephone number: _____ Electronic mail address:_____

MEMBERSHIP CATEGORIES

Please indicate below the category for which you are applying. AWM membership year is **OCTOBER 1ST to SEPTEMBER 30TH.**

Dues Schedule
Indicate amount enclosed

_____ Sponsoring Category I (may nominate 10 students for membership): $120

_____ Sponsoring Category II (may nominate 3 students for membership): $ 80

NOTE: List names and addresses of student nominees on opposite side or attach separate page.

SEND TO: AWM Membership, 4114 Computer and Space Sciences Bldg., University of Maryland, College Park, MD 20742-2461. Any questions, call 301/405-7892.

AWM

ASSOCIATION FOR WOMEN IN MATHEMATICS

Individual Membership

Date _____19____

Please fill out this application and return it as soon as possible. Your individual membership will be updated immediately. Subscription to the AWM Newsletter is included as part of membership. AWM membership year is **October 1st to September 30th.** See next page to determine membership category you are eligible for.

Indicate below how your name and address should appear in the AWM Membership List.

_____

Last Name First Middle Initial

Address for all mail: _____

_____

_____

Family member name (if applicable):

_____

Last Name First Middle Initial

Are you a new member?_____ Is this an address change?_____

Telephone numbers -- Home: _____ Work: _____

E-mail address (if any): _____

Degrees (with institutions and dates) :

_____

_____

_____

Present position: _____ Institution or Firm: _____

_____

City State Zip/Country

Primary Fields of Interest. Select up to **5** from list on next page. _____ _____ _____ _____ _____

Please indicate below if you would allow your name, address and phone number to be included in the AWM Membership Directory. Yes _____ No_____ Please Initial: _____

SEND TO: AWM Membership, 4114 Computer and Space Sciences Bldg., University of Maryland, College Park, MD 20742-2461. Any questions, call 301/405-7892.

Fields of Interest

00 General
01 History and biography
03 Mathematical logic and Foundations
04 Set Theory
05 Combinatorics
06 Order, lattices, ordered algebraic structures
08 General algebraic systems
11 Number Theory
12 Field Theory and Polynomials
13 Commutative rings and algebras
14 Algebraic Geometry
15 Linear and multilinear algebra: matrix theory
16 Associative rings and algebras
17 Nonassociative rings and algebras
18 Category Theory, homological algebra
19 X-theory
20 Group theory
22 Topological groups, Lie groups
26 Real Functions
28 Measures and Integration
30 Functions of a complex variable
31 Potential theory
32 Several complex variables and analytical spaces
33 Special functions
34 Ordinary differential equations
35 Partial differential equations
39 Finite differences and functional equations
40 Sequences, series, summability
41 Approximations and expansions
42 Fourier analysis
43 Abstract harmonic analysis
44 Integral transforms, operational calculus
45 Integral equations
46 Functional analysis
47 Operator Theory
49 Calculus of variations and optimal control
51 Geometry
52 Convex and discrete geometry
53 Differential geometry
54 General topology
55 Algebraic topology
57 Manifolds and cell complexes
58 Global analysis, analysis on manifolds
60 Probability theory and stochastic processes
62 Statistics
65 Numerical analysis
68 Computer Science
70 Mechanics of particles and systems
73 Mechanics of solids
76 Fluid mechanics
78 Optics, electomagnetic theory
81 Quantum Theory
82 Statistical mechanics, structure of matter
83 Relativity and gravitational theory
85 Astronomy and Astrophysics
86 Geophysics
90 Economics, operations research, programming, games
92 Biology and behavioral science
93 Systems theory, control information and communication, circuits
94 Information and communication, circuits

001 Education: K-8
002 Education: 9-12
003 Education: Undergraduate
004 Education: Graduate
005 Gender Issues
006 Affirmative Action
007 History of Woman in Math Sciences
008 Other (please specify:_____

_____

MEMBERSHIP CATEGORIES

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.**

DUES SCHEDULE 1992/1993
(Please note changes from last year).

REGULAR MEMBERSHIP..... (Base dues $25 plus $5 prize fund and $10 general)	$ 40	_____
FAMILY MEMBERSHIP..... (Base dues $40 plus $5 prize fund and $10 general)	$ 55	_____
CONTRIBUTING MEMBERSHIP.....	$100	_____
STUDENT, RETIRED, OR UNEMPLOYED MEMBERSHIP.....	$ 8	_____
ALL FOREIGN MEMBERSHIPS (INCLUDING CANADA & MEXICO) ..... NOTE: All payments must be in U.S. Funds using cash, U.S. Postal orders or checks drawn on U.S. Banks.	ADD $ 8	_____

TOTAL DUES $_____

ANNOUNCEMENTS:

CALL FOR VOLUNTEERS - VANCOUVER, CANADA - AUGUST 1993

The Association for Women in Mathematics will be in Vancouver for the International Joint Mathematics Meeting hosted by AMS-CMS-MAA on August 15-19, 1993. We would like to ask for volunteers (especially students) who will be attending the meeting to HELP SET-UP, STAFF, AND PACK-UP OUR INFORMATION TABLE. If you are interested in helping out, please send you name, address, telephone number, e-mail address and arrival and departure dates (if known) by JULY 15 to:

Dawn V. Wheeler
Association Administrator
Association for Women in Mathematics
4114 Computer and Space Sciences Bldg.
University of Maryland
College Park, Maryland 20742-2461
301-405-7892
E-mail: awm@math.umd.edu

1992-93 DUES REMINDER

Since our 1992-93 membership year is winding down, we'd like to ask those of you who have not yet sent in your 1992-93 dues to do so. Some of you may have been waiting until we got settled in our new home and most likely you've been very busy, but we really do need your check. If we don't receive your 1992-93 dues by June 15, THIS ISSUE OF THE NEWSLETTER WILL BE THE LAST YOU WILL RECEIVE. If you're not sure if your membership is up-to-date, please feel free to contact us and we'll let you know. Please renew today. Note: These dues are for **October 1, 1992 to September 30, 1993** membership. We look forward to hearing from you soon.

Send membership dues and/or contributions to:

Dawn V. Wheeler
Association Administrator
Association for Women in Mathematics
4114 Computer and Space Sciences Bldg.
University of Maryland
College Park, Maryland 20742-2461
301-405-7892
E-mail: awm@math.umd.edu

A SPECIAL THANK YOU TO THOSE MEMBERS WHO SENT IN AN EXTRA CONTRIBUTION TO HELP DEFER OUR MOVING COSTS. WE APPRECIATE YOUR SUPPORT. IF ANY OF OUR OTHER MEMBERS WOULD LIKE TO CONTRIBUTE WE ARE STILL IN NEED OF FUNDS.

PLEASE NOTE OUR NEW E-MAIL ADDRESS: awm@math.umd.edu

AWM

Newsletter

Volume 23, Number 3, May-June 1993

AWM
ASSOCIATION
FOR WOMEN IN
MATHEMATICS

4114 Computer and Space Sciences Bldg.
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