AWM
ASSOCIATION
FOR WOMEN IN
MATHEMATICS

PRESIDENT'S REPORT

No New Address: We Moved ... to Wellesley!!

After negotiations concerning a new home came down to the wire (gulp!), the Wellesley Mathematics Department made a very generous gesture toward AWM, offering us temporary space, although space was in short supply for them. On August 31st we moved to the Science Center at Wellesley. This was minimally disruptive for us and buys valuable time. In the process of seeking a new location, we realized anew the strength of our ties to Wellesley. And our current location provides access to the Wellesley mathematics community, a big plus for us. Jodi Beldotti has already had the chance to meet many faculty and students, and at least one of the math majors is also an office assistant now! Many heartfelt thanks to our friends at Wellesley, including a new friend, Barbara Beatty in Education, and an old friend, Martin Magid, Math Chair, for going to bat for AWM. Thanks are also due our friends at the AMS office in Providence, who provided essential support during a summer in which plans came unraveled at alarming rates.

Long Range Planning

Cora Sadosky, President-Elect, and I have formed a Long-Range Planning Committee with its first meeting scheduled in early October, with members Anne Leggett (Newsletter Editor), Judy Green (Treasurer), and two past Presidents, Mary Gray and Linda Keen. Cora and I hope that the collective wisdom of this group will help us sort out future goals and structure of the organization, after a period of exciting growth and related upheaval. We should have much to discuss and report in San Antonio to the Executive Committee and to the general membership.

Joint Meetings in San Antonio

We have big plans in the works for San Antonio, and I hope many of you will be able to attend and participate. Final word is pending on

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NSF and ONR support for the AWM workshop on Tuesday, January 12, 1993; we are optimistic, and I urge all members to schedule early arrival, to attend as much of the day-long workshop as possible, and to sign up for the dinner that night.

Wednesday and Thursday in San Antonio

The AWM panel on Wednesday, January 13th is entitled "Is Geography Destiny? How personal circumstances affect the careers of women in mathematics." There will be several invited participants; in the current spirit of interactive learning, the format will provide considerable time for the audience to speak as well. Almost all of us have experience in balancing our own needs to work near family and friends with the job opportunities available to us. These needs may involve the traditional two-body problem (i.e., wife-husband), which alone is a serious matter for a number of our members and will occupy some of the panel's attention. But there are additional and broader issues of where to work which confront women mathematicians — perhaps more often than the traditional men mathematicians. Please attend and bring your views!

The business meeting will follow the panel on Wednesday and will include the presentation of the third Hay Award for outstanding contributions to mathematics education.

I am delighted to announce that Linda Keen will be the 1993 Emmy Noether Lecturer. The Lecture will take place Thursday, January 14, 9–9:50 A.M. (title to be announced). We will host a dinner in her honor, open to all, either Wednesday or Thursday night, at her convenience, with sign-up available at the meeting.

The AWM party is Wednesday night at 9:30 P.M. and is always the best party of the meetings, in my biased opinion.

Response to Response to Science

In the last issue I asked for other views concerning the *Science* article about Women in Mathematics. I have heard disagreement to the claim that mathematics isn't worse than other areas from some of the very women in our community who have cracked the glass ceiling! One of my early President's Reports listed the "top" schools with no or few women among their tenured faculty; the updated figures at these schools continue to dismay us all. So, let me say that those guys should realize that if their definition of suitable colleague excludes all (or all but a handful of) talented women mathematicians, then there's something wrong with their definition. And we all know that mathematicians should always formulate definitions with care!

Still Hanging Fire

In the last report I mentioned that there were many things in progress about which I could not report. Some have been resolved, but one of great interest to many members is the negotiation

between Jenny Harrison and U.C. Berkeley concerning her tenure case. Having learned that these negotiations were at a delicate state and hoping for some last minute change, we remained quiet on these pages in the previous issue, at risk of having our silence misinterpreted as censorship or indifference. This issue includes a report by Cathy Kessel and Charity Hirsch, and we once more hold space for late-breaking news from the principals — fingers and toes crossed that things will work out for the best.

**SEE YOU IN
SAN ANTONIO!!!**

Carol

*Carol Wood
Middletown, CT
September 27, 1992*

LETTERS TO THE EDITOR

To the Editor:

During the past year *Science* magazine, the principal publication of the AAAS, has featured a series of articles on Women in Science. The ones I wish to address relate to mathematics:

1. June 28, 1991, p. 1781 (an article about the Jenny Harrison case, featuring a table of data about the number of tenured men and women at leading universities),

2. March 13, 1992, beginning after p. 1359 (a series entitled "Women in Science"), and

3. July 17, 1992, p. 323 (an update and sharpening of the data first given in (1) above, also several letters to the Editor about (2). One of those letters was from 18 prominent women mathematicians, and another was from a Press Officer at Princeton University.)

Particularly relevant for mathematics are the data given in (1) and (3).

That data showed that as of July 17, 1992 there were 288 men and five women in the tenured faculty at the selection made by the author, Paul Selvin, of ten universities with strong research departments. Among those five women, one has since resigned, a second (myself) has a back door appointment, and a third has a position which is unrelated to the research activities of the mathematics department, leaving two out of 288 if you redo the count. The data was very carefully collected. It reflected an understanding of the sociology of mathematics at the universities in question in ways which I have never seen in print before. To be sure, the universities which were considered are a tiny fraction of the ones in this country which are producing excellent mathematics. On the other hand, the impact of those frankly elitist universities (Berkeley, CalTech, Chicago, Columbia, Harvard, MIT, Michigan, Princeton, Stanford, Yale) on mathematical research has been profound. No less profound is the message conveyed to women: they are excluded from the very best institutions.

Additional data which were published by the AMS in the September 1992 issue of the *NOTICES* of the AMS show more: the percentages of women in other elitist positions in our profession (members of editorial boards, speakers giving one-hour invited addresses at AMS meetings, speakers at special sessions, trustees and Council members) are also far below the percentage of U.S. women who receive the Ph.D. degree in mathematics.

I have been very disappointed at the reactions of the AWM. The first AWM reaction which I saw was a brief and petulant comment by AWM President Carol Wood, which was published on the front page of the May-June issue of the AWM *Newsletter*. Carol objected very strongly to the "negative tone and discouraging message" in Paul Selvin's article (2). She pointed out one spot where the article was open to misinterpretation, but did not go so far as to suggest that anything in it was not true. She ended her brief comments with a one word sentence, "Not!", which I understand to mean that she didn't like the message. Others made the point (in private conversations) that the AWM, which has done so much to encourage more women to go on in mathematics, cannot now allow them to be scared away from the field, and the negative tone of Selvin's piece might do that.

A second AWM response to Selvin's article, signed by eighteen leaders of the AWM, was published in the Letters to the Editor column of the

July 17, 1992 issue of *Science* magazine. That letter rightly noted the progress that women have made over the past 15–20 years. It made no mention of Selvin's data. It ended by referring readers who seek "a more balanced report" on the status of women to the well-intentioned September 1991 issue of the *NOTICES* of the AMS, which was devoted to Women in Mathematics. That was a generally upbeat series of articles, about entirely different aspects of the profession.

Experience shows that without knowledge there cannot be progress. If unpleasant facts are concealed or misconveyed, the likelihood of qualified women moving into their rightful places in the top universities will be diminished. Thus I was very disappointed by the attitude of denial taken by those 18 prominent women mathematicians. Indeed, their Letter to the Editor of *Science* was followed by another (in the same issue) written by a representative of Princeton University. She took issue with Selvin's data in ways which I can only call shamefully dishonest. That is what we are up against. If the AWM hopes to continue to speak as an Association for Women in Math, it must not play the role of a censor, for in so doing it cooperates with the very forces which keep women down.

Sincerely, Joan S. Birman

To the editor:

My thanks to Judy Green, Alice Schafer and June Winter for attending the hearing in Washington D.C. on "Sexual Harassment in Male-Dominated Occupations" in June of '92 and to Judy Green for her report to the AWM on the hearing. I would like to add my impressions. What struck me most strongly about that hearing, and stays with me still, was the feeling of excitement and support expressed by the members of Congress, panelists and audience. The hearing room was filled to overflowing, and the electricity was palpable in the air. Friends who attended with me said that even in the halls, you could tell this was the exciting hearing: other rooms were nearly empty but there was a crowd around the door to this room; it took mathematician Ray Brown 45 minutes to get into the room.

Unlike Green who felt "even the women in Congress have no idea what the problem is," I was quite impressed with the contributions of Congresswomen Pat Schroeder, Connie Morella, Patsy Mink, Olympia Snowe and Susan Molinari. Their perception, interest and quickness to consider opportunities to make a difference for women in male-dominated fields were apparent. For example, Schroeder said, "We should ensure that women who want to be scientists or mathematicians or construction workers are given the same opportunities and have the same experiences as men. Unfortunately, this is not happening." Mink spoke of establishing "demonstration programs" to support women and minorities who want to enter math and science. Morella cited common problems women graduate students face in science and

engineering. H.R. Bill 3476, sponsored by Morella, would set up a commission to "study the roadblocks that prevent women from advancing in [science and engineering] and would dispel the myth and the messages that women often receive from society that there are some things they cannot do."

Green made an interesting point about "sexual harassment" versus "gender discrimination." There is no denying that "sexual harassment" is a more provocative term and was probably chosen for the title of the hearing for that reason. However, it was clear to those organizing the hearing that sexual harassment and gender discrimination are simply two sides of the male chauvinist coin. If our society did not favor men, women could afford to dismiss crude jokes and propositions. It was not hard for one of my fellow panelists, neurologist Maureen Polsby, to reject the advances of her research director at National Institute of Health. It became a serious issue when he used his position to take her off research projects, give her research ideas to others and deny her residency. Most women, including mathematicians, experience sexual advances in the workplace, and some are punished for refusing them. (My experience in counseling women students has been that sexual harassment is not uncommon and can be extremely damaging to their ability to perform as mathematicians.) Our punishment may be denial of professional advancement, adding to other barriers we may encounter because of our gender.

Green characterized the four witnesses, Dawn Munday, a garbage truck driver; Nancy Pease, a maintenance engineer; Polsby; and myself, as "victims," whereas a more positive description was in order. True, we had all experienced sexual harassment and discrimination, but not more than many women. For three of the four of us, the most serious penalties came after we had brought our complaints of discrimination. Polsby was unable to practice medicine for five years; Munday was hospitalized for stress-related illnesses; I had been unemployed for two years and suffered a serious physical reaction to stress. Only Pease, who was threatened with death, had found a job in a supportive environment. What impressed me about my fellow panelists was not their suffering but their strength — their willingness to jeopardize their personal lives and careers to resist discrimination, and their intellectual acuity and integrity.

I think what motivated us all is what motivated Rosa Parks and Anita Hill — the feeling that our pain will be worthwhile if we make it unnecessary for those who follow us. As a child in Alabama, I stood and watched George Wallace block the "schoolhouse door" at the University of Alabama in his effort to prevent integration; I then watched in awe those first Black students who had been spat on, walking to class a few days later. A few years later the campus was completely integrated. I know I was inspired by the example Anita Hill gave: a voice of honesty and reason, speaking the truth, no matter how unsympathetic the audience, no matter what the cost, trusting others to do justice based on that truth. It seemed the Congresswomen had also felt the power of Anita Hill's example and were ready to speak out for justice and change. They were eager to try and improve the circumstances of women in male-dominated fields. They conveyed a sense of power and support which continues to sustain me.

I feel much more optimistic as a result of that Congressional hearing than Green (though I must acknowledge I have been accused of congenital optimism). Granted, much more needs to be done to improve opportunities for women in math than raising their self-confidence. Still I feel that women are now speaking out and organizing, and politicians are likewise increasing their level of consciousness. If we can continue to build on the momentum evidenced in that hearing, our students should not have to fight for elementary equality of treatment.

Sincerely, Jenny Harrison

CORRECTIONS

While entering AMS election statements for the last issue, I slipped into a time warp and gave an old affiliation for Steve Krantz. Professor Krantz has been at Washington University, St. Louis, for seven years. Sorry, Steve!

UME Trends will be published by the AMS only until the end of 1992. As of the 1993 subscription year, the MAA will be the new publisher.

Someone with the last name Datta sent me an address change. In my attempt to forward the message to the Wellesley office, I sent it into electronic limbo. Please resubmit your request.

CONFERENCE IN HONOR OF CHANDLER DAVIS

On June 13, 1992, at the University of Toronto, Ontario, Canada, a one-day conference organized by Peter Rosenthal (University of Toronto) was held in honor of AWM member Chandler Davis on his retirement. Chandler turned 65 in 1991, and compulsory retirement is the rule at the University of Toronto.

The three aspects of Davis's life that were discussed during the conference were his contributions to mathematics, his writings in science fiction, and his social activism. First I will give the events of the conference, and then I will talk more about these three aspects.

James Donaldson of Howard University spoke on "Chandler Davis and the American Mathematical Society." Since those in attendance at the conference were not all mathematicians, the mathematical talks were aimed at a general audience. Peter Rosenthal spoke of some work of Davis on matrix equations; Davis spoke on "Some theorems I wished I had proved," and John Holbrook of the University of Guelph spoke on "Dragons and Bad Matrices." The contributions he has made to the science-fiction community were discussed in a talk given by Judith Merril, science-fiction author and editor.

An AWM mug was presented to Davis, and Cora Sadosky, President-Elect of AWM, sent a message from Barcelona. Here are some excerpts:

> What about his science-fiction story writing? Well that may be harder to include in this, though one may think of a story in which the best math departments of the world had many excellent women in their faculties. Would that be science fiction for centuries to come? No, if more and more mathematicians join our struggle, as Chan Davis has....

> While our founding mothers were creating AWM, twenty-one years ago, Chandler was at their side, but I was not even in the States.... Chandler, meanwhile, was able to combine the work at MAG with the support of AWM.

> And his support has continued ever since. It has given all of us who have the joyous privilege of his counsel and criticism, the opportunity to learn how one can be at the same time level-headed and un-compromising, patient and ardent, tolerant and unyielding.

Chandler Davis and his new mug

A videotape made about the events Davis was involved in during the McCarthy era at the University of Michigan was shown. Professor Wilfred Kaplan of the University of Michigan was present to answer questions and to comment on the videotape.

In the evening there was a banquet, where, among other things, Lee Lorch spoke of Davis's contributions to AWM.

If one types Chandler Davis into the MathSci Disc, 1988-1991, 31 items come up. If one does similarly for 1980-1987, 72 items come up. These discs summarize information from *Mathematical Reviews* (MR), so both articles he wrote (or co-authored) and articles he reviewed are cited. Among the areas in which he has made contributions are linear algebra and operator theory. The 103 citations indicate the quantity of his mathematical

by Ruth Rebekka Struik, University of Colorado, Boulder

contributions; the quality of these contributions is reflected by the fact that an issue of *Linear Algebra and its Applications* will be dedicated to him. [See the May, 1992 issue for details.]

Davis has been interested in science fiction for decades. Stories he has written that Davis thinks might interest readers of this newsletter are: "The nightmare," about the threat of nuclear war; "Last year's grave undug," about political witch-hunting leading to social breakdown; "Adrift on the policy level," about scientific advice getting shuffled aside in a corporation where salesmanship counts for more than content; and "The star system," about a future in which the stereotype that women must choose between having a professional life and having a sexual nature is carried to a ghastly extreme. "The nightmare" appears in *A Treasury of Science Fiction*, and "Last year's grave undug" appears in *Great Science Fiction by Scientists*; both were edited by Groff Conklin. "Adrift on the policy level" is in *The Expert Dreamers*, edited by Frederik Pohl. If you have trouble locating these in your local library, write Davis at the University of Toronto.

Davis's activities on behalf of social justice should be of particular interest to AWM members.

This is typical of my interactions with Davis over the last few decades: several months ago, he sent me petitions to circulate to get Linda Keen (AWM past president) and Carol Wood on the ballot for AMS offices. Both were on the ballot, and both were elected.

During the McCarthy era, Davis went to jail for several months. Why? For details, read Davis's article "The Purge" in *A Century of Mathematics in America*, Part I, 413–425, MR 90h:01027. Another good source is the book *No Ivory Tower*, by Ellen W. Schrecker, Oxford University Press, 1986; look in the index under Chandler Davis. Davis was fired from the University of Michigan, which was put on the censured list of the AAUP for the way they fired Davis and a colleague, Mark Nickerson (pharmacology). Another colleague, Clement Markert (zoology), survived. Davis was unable to get a faculty position in this country after the firing and the jail term. Eventually he accepted his present position at Toronto.

Davis's wife is Natalie Zemon Davis, a distinguished historian who has been president of the American Historical Association. They have raised three children while she has been at Princeton, he at Toronto. Davis has been a very supportive husband. Very likely he has had to sacrifice some glory in his

career as a mathematician so that his wife could do scholarly work. Davis' answer to this was:

> Many years ago an older woman mathematician took me to task for spending so much time on housework so my wife could get her research done, to the detriment of my own career. I was flabbergasted: this wasn't my own view of the relationship at all. It still isn't. Any theorems I failed to prove, it was just that I wasn't smart enough. I never felt that I was transferring scholarly achievement (giving up .6 theorems per month in exchange for .4 historical discoveries?!), nor is such transfer possible. It is true that I babysat and changed diapers and all; that was part of living my life the way I wanted to live it. My wife's creative achievements, by the way, never were felt as representing a sacrifice; they were an important component in the satisfaction of my life.

NMSU SYMPOSIUM

The Department of Mathematical Sciences of New Mexico State University continues its Holiday Research Symposium series with a program of lectures by Professor Georgia Benkart, University of Wisconsin, along with sessions for contributed papers, informal talks, and discussion. Professor Benkart will deliver ten lectures acquainting researchers and graduate students with Lie theory and combinatorics and disseminating information presently unfolding about both areas and their applications throughout mathematics.

The interaction between combinatorics and representation theory has been a recurrent theme throughout twentieth century mathematics, from the work of Schur at the beginning of this century through Kac-Moody algebras and quantum groups. Each advance in the theory has found application (e.g., invariant theory, differential equations, the chromodynamics of quarks). Professor Benkart's lectures will survey the history of this interaction, present recent results, and discuss open problems.

The Symposium will be held December 27–31, 1992. Inquiries should be directed to: David Finston, dfinston@nmsu.edu, Susana Salamanca-Riba, ssalaman@nmsu.edu, or Robert J. Wisner, Department of Mathematical Sciences, New Mexico State University, Las Cruces, NM 88003.

CALL FOR NOMINATIONS: ALICE T. SCHAFER MATHEMATICS PRIZE

The Association for Women in Mathematics calls for nominations for the Alice T. Schafer Mathematics Prize in the amount of $1000 to be awarded to an undergraduate woman for excellence in mathematics. All members of the mathematical community are invited to submit nominations for the Prize. An institution may have more than one nominee.

The nominee may be at any level in her undergraduate career. The letter of nomination should include, but not be limited to, an evaluation of the nominee on the following criteria: quality of performance in mathematics, exhibition of real interest in mathematics, ability for independent work, and performance in mathematical competitions at the local or national level, if any.

Supporting materials should be enclosed with the nominations. Please send *five copies* of the letter and other materials. Nominations are due by **March 22, 1993** and should be sent to Jodi L. Beldotti, Executive Director, AWM, Box 178, Wellesley College, Wellesley, MA 02181; (617) 237-7517.

ANOTHER DUES REMINDER:
By now, you should have received your dues renewal form. If you sent in your renewal check before receiving a form and received a renewal form anyway because things crossed in the mail, please accept our apology for the nuisance and our thanks for doing your bit to help solve our financial crisis. If you are seeing this, but have *not* received a renewal form nor sent in your dues, remember that our database is in much better shape, but not exactly perfect. If you are in the database too few times or too many times, please bring this to the attention of the Wellesley office.

VOLUNTEERS NEEDED!
If you plan to attend the joint meetings in San Antonio this January, you may want to consider volunteering at the AWM information table for an hour. I spent an afternoon staffing the table at the Baltimore conference last year and consider this to be one of the highlights of the conference for me. Not only did I meet several interesting mathematicians, I was able to convey my enthusiasm for AWM to newcomers. In addition, I was deeply impressed by the number of men who came to ask questions and to join AWM — I hadn't realized before that the organization speaks to such a large audience! Staffing the table is easy — just help people fill out membership forms, answer basic questions, and hand out materials. Usually, a more "official" type person is there to handle any tougher questions. Oh, one more bonus — introductions made at the AWM table turned into invitations for two job interviews! Whether or not you choose to volunteer at the table, definitely stop by to introduce yourself and to check out some of the AWM handouts.

by Catherine A. Roberts, University of Rhode Island

NSF-AWM TRAVEL GRANTS FOR WOMEN

The objective of the NSF-AWM Travel Grants is to enable women to attend research conferences in their field, thereby providing a valuable opportunity to advance women's research activities, as well as to increase the awareness that women are actively involved in research. If more women attend meetings, we increase the size of the pool from which speakers at subsequent meetings are drawn and thus address the problem of the absence of women speakers at many research conferences.

The Travel Grants. The grants will support travel and subsistence to 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. Applicants must be women holding a doctorate in a field of research supported by the Division of Mathematical Sciences of the NSF (or have equivalent experience). A woman may not be awarded more than one grant in any two-year period and should not have available other sources of funding (except possibly partial institutional support).

Target Dates. The three award periods have deadlines of February 1, May 1 and October 1.

Applicants should send *five copies* of their application, which consists of a description of their current research and of how the proposed travel would benefit their research program, a curriculum vita and a budget, to: Association for Women in Mathematics, Box 178, Wellesley College, Wellesley, MA 02181.

HONORS AND AWARDS

CONGRATULATIONS to the women below for their meritorious achievements.

Diane M. Henderson, Pennsylvania State University, applied mathematics, and Kathryn M. Roeder, Yale University, probability and statistics, are among the eight NSF Young Investigator awardees in the mathematical sciences. The Young Investigator program replaces the NSF's Presidential Young Investigator Awards program. The awards are intended to enhance the research and teaching careers of outstanding beginning faculty and to foster cooperation between academia and industry. Each investigator may receive a maximum of $100,000 per year for five years through a combination of federal and private funds. NSF provides up to $62,500 annually for each awardee.

Ingrid Daubechies has received a MacArthur Fellowship.

After receiving her Ph.D. (in physics) from the Free University Brussels in 1980, Ingrid Daubechies did postdoctoral research in mathematical physics (with E. Lieb) at Princeton University. She then returned to the Free University Brussels where she received tenure as a Professor of Physics in 1984. In that year she also received the Louis Empain prize, which is awarded once every 5 years to a young Belgian scientist for research done before the age of 29. Her research in this period was concerned with foundational problems in quantum mechanics, coherent states, path integrals, and relativistic stability of matter.

In the mid-80's she began working on the mathematical theory of wavelets, which was just beginning to emerge as an important new tool in signal analysis. In 1987 she constructed the first example of an orthonormal basis of wavelets with both continuity and compact support; this breakthrough led to a number of applications and generalizations with the result that wavelets have now become the latest "hot topic" in applied mathematics.

In 1987 she joined the technical staff in mathematics at AT&T Bell Labs. Prior to that she had also held postdoctoral positions at Bell Labs, the CNRS in Marseille and the Courant Institute. In 1990 she held an NSF-VPW visiting professorship at the University of Michigan. In 1992, she became Professor of Mathematics at Rutgers University while retaining an affiliation with Bell Labs.

She is also recognized as a superb expositor. In 1990 she was the principle lecturer at the NSF-CBMS conference on wavelets held at the University of Lowell. Her CBMS lecture notes (whose completion was slightly delayed by the birth of her second child) were in such demand that SIAM had already sold over 1000 copies before they appeared in print in April, 1992. In January, 1992 she was an MAA lecturer at the Joint Mathematics Meetings in Baltimore; she is now in charge of the short course on wavelets planned for the January, 1993 meeting in San Antonio.

Two of the 1992-1993 Bunting Fellows are mathematical scientists. Janet Talvacchia, Swarthmore, works on Yang-Mills-Higgs theory. Bonnie Berger is delivering a Bunting colloquium entitled "Using randomness to design efficient deterministic algorithms."

Sarah A. Douglas, University of Oregon, India; Dianne C. Hansford, Arizona State University, Germany; and Rae M. Shortt, Wesleyan University, Germany were Fulbright Scholars during the 1991-1992 academic year. (The country in which the award was taken follows the affiliation of the scholar.)

Professor Delia Koo of Eastern Michigan University, Ypsilanti, received the 1991 MAA Meritorious Service Award from the Michigan Section. Now professor emerita at Eastern Michigan, she was an active participant in and leader of Michigan Section activities for many years. She served as Secretary-Treasurer, Vice Chair, Chair, Executive Committee member, and Section Governor.

Professor Nancy Reid, Department of Statistics, University of Toronto, has received the 1992 Presidents' Award from the Committee of Presidents of Statistical Societies. The first woman and the first faculty member of a Canadian university to receive the honor, Reid was also named a fellow of the American Statistical Association in 1989. The award, one of the most prestigious in the statistical profession, is international and is presented annually to a statistician under the age of 40 who has excelled in all areas of the profession, including research, communication of important advances, editing and refereeing, and service.

A REPORT ON THE JENNY HARRISON TENURE CASE

An often quoted statistic is that in 1991 there were three women and about 300 men tenured in ten of the most prestigious U.S. mathematics departments. Yet the percentage of women Ph.D.'s in mathematics has averaged 20 over the past ten years, and women now get about half of the B.A.'s in mathematics. What is happening? And why?

One case illustrates some of the problems women face in achieving recognition in the most prestigious math departments. In 1986 Jenny Harrison, assistant professor at the math department at the University of California, Berkeley, was denied tenure. In 1989 she brought a sex-discrimination suit against the University of California.

Since then there has been wide media coverage of this case, including national television and radio broadcasts of Harrison's June 1992 testimony before the U.S. Congress. Presently the University of California and Harrison are discussing a possible settlement, so it is not timely to reiterate or further disclose her experiences of discrimination for this newsletter. (Published articles about the case, including her testimony before Congress, can be obtained upon request from the Support Committee for Jenny Harrison, 841 Coventry Road, Kensington, CA 94707.)

Harrison has received world-wide support. The American Association of University Women adopted her case in 1990; this was the first group to help Harrison in her fight. In January 1991 the Support Committee for Jenny Harrison formed. Consisting of mathematicians, mathematicians' wives, other academics, and a diverse group of community people, the Committee began to meet regularly, raise funds, publish newsletters, and discuss activities to publicize and support her case. Since that time the American Association of University Professors, the Association for Women in Science, the California Commission on the Status of Women, the American Federation of Teachers, Congressman Ronald Dellums, several state legislators, and numerous notable mathematicians and scientists have endorsed her case.

by Cathy Kessel and Charity Hirsch, Support Committee for Jenny Harrison
The trial scheduled for October 1992 has been taken off calendar, and the depositions indefinitely postponed.

If Harrison returns to the department, she hopes not only to continue with her research (as she has done since she was denied tenure) but to establish with the University of California a Center for Women in Mathematics. Her goals for the Center would be to recruit, support and retain women students and faculty. The Center might also study what is happening to women in math and why. Mathematicians such as Uri Treisman and Richard Tapia have run programs for minority and women students that have been very successful not only in getting these students into university programs but in getting them through successfully. Harrison hopes to achieve similar success.

Seeing first-hand how sustaining organized support can be, Harrison hopes to organize groups of women students into their own mutual support groups. She and several current UC women graduate students would interview women students regularly. She hopes to do video interviews every few years, to document how such women's careers and lives develop (modeled on the British film series "7 Up," "14 Up," etc.).

The events of the past six years have given Harrison an understanding of the problems women in mathematics face and some experience in solving them. Moreover, her struggle has given her the strength and impetus to help others. As she said before Congress, "A lot of problems out there can be fixed. I am not speaking of remedial math but practical advice, a helping hand at the right moment."

SIAM MEETING

The AWM had a full day of activities on July 21, 1992 at the SIAM 40th Anniversary Meeting in Los Angeles. The Alice T. Schafer Mathematics Prize was awarded in the morning. AWM sponsored a luncheon for women to discuss funding and research opportunities with a panel of three speakers from funding agencies and government laboratories. Deborah Lockhart from the National Science Foundation discussed their increased emphasis on interdisciplinary research. She surveyed the summer research grants, post-doctoral opportunities, graduate fellowships, and the Research Opportunities for Women and the Visiting Professorships programs. In addition to comments on the basic format of a grant proposal, she recommended contacting the appropriate program director to discuss your research plans before submitting a proposal.

Henry Ashkenas from Jet Propulsion Lab discussed postdoctoral, undergraduate, and faculty research opportunities available through NASA. Neil Gerr from the Office of Naval Research explained that his agency is mission oriented and commented on the specific areas in their grants programs.

That afternoon five women spoke in the AWM Panel on Research in Government. Laif Swanson from Jet Propulsion Lab spoke on "Coding Theory for Deep Space Communications." She started with a discussion of the Galileo spacecraft and its communication facilities. Pamela Coxson from Lawrence Livermore Lab presented her work on "Dynamic Positron Emission Tomography and Diagnosis of Cardiac Heart Disease." She explained how PET scans work and the ongoing experiments to detect cardiac stress. Alexandra Tolstoy from the Naval Research Lab spoke on "Applied Mathematics in Underwater Acoustics." Besides the usual detection uses, remote sensing can be used for oceanic and atmospheric studies. The difficulties of the heterogeneity of the water, surface scattering, and the hyperbolic partial differential equations involved were discussed. Suzanne Lenhart of Oak Ridge National Lab and the University of Tennessee spoke on "Environmental Modeling at ORNL." She surveyed research efforts in climate modeling, groundwater flow simulation, and "in situ"

by Suzanne Lenhart, University of Tennessee
See photos, pages 27 and 28.

vitrification. Fern Hunt of the National Institute of Standards and Technology and Howard University reported on "Fractals, Invariant Measures, and Research at NIST." She explained the numerical calculation of fractal dimension using invariant measures and its application to supercooled liquids. The success of this panel could be seen by the large enthusiastic audience.

The day ended with a dinner in honor of the Schafer Prize winners. Joyce McLaughlin of Renselaer Polytechnic Institute is to be commended for her organization of the luncheon and the panels. Jodi Beldotti did a beautiful job of coordinating the whole day of activities.

JOINT COMMITTEE

The Joint Committee on Women in Mathematics (JCW) is an appointed committee of the AMS, MAA, SIAM and other math societies. Its activities (hopefully) complement those of the AWM. Its charge is "to identify and recommend to the [councils of those societies] those actions which in their opinion the Societ[ies] should take to alleviate some of the disadvantages that women mathematicians now experience and to document their recommendations and actions by presenting data." AWM has two representatives on this committee, Evelyn Silvia and Joan Hutchinson. A complete list of members and the societies they represent appears in the September AMS *Notices*.

The Joint Policy Board on Mathematics (JPBM) has asked the JCW to explore the federal policy aspects of gender equity issues and make recommendations to JPBM. This request was made in response to the House Bill on Women and Science and as part of a broader program of establishing a federal policy agenda for JPBM. The following have agreed to serve on the JCW policy subcommittee: M. Beth Ruskai (chair), Nancy Flournoy, Joyce McLaughlin, Linda Petzold, and Evelyn Silvia.

Another JCW subcommittee will explore the possibility of doing a study or survey of gender-related hiring practices at top institutions. Its members are Joan Hutchinson (chair), Margaret Cozzens, Jeanne Wald Kerr, J. Peter May, and M.B. Ruskai (ex officio).

The JPBM decision to endorse the House Bill on Women and Science legislation was made upon the recommendation of the JCW. At the instigation of the JCW, the JPBM endorsement included the following statement: "JPBM encourages Congress to ensure that the Commission is representative of women mathematicians, scientists, and engineers and that the Commission utilizes the expertise of organizations familiar with issues relating to women in the mathematical sciences, particularly the AWM."

BARBIE

I'm sure most of you heard in October about the new "Teen Talk" Barbie. I have received more email on this topic than any other in the news, ever. Talking Barbie has a database of 270 phrases, four of which are activated in any individual doll. One of these phrases is "Math class is tough." When hit with complaints about this, Mattel's response is that they aren't saying the other classes are easy, and anyhow some of the dolls say "I want to be a doctor."

Right. They seem to be overlooking how young most girls are when they get their first, second, n^{th} Barbie. In elementary school, most girls haven't learned yet that math is supposed to be hard for them. So now some of them will get a doll that tells them it *is* tough one-quarter of the time she speaks.

To contact Mattel to register a complaint, you may write to them at Mattel Toy Corp., Consumer Service Department, 330 Continental Blvd., El Segundo, CA 90245 or call the Mattel Consumer Service Department at 1-800-421-2887. They were swamped with calls in October; it wouldn't hurt for them to get another barrage now, especially in the middle of the Christmas buying season.

At this time, several organizations have also registered their protest. The American Association of University Women (AAUW), the National Council of Teachers of Mathematics (NCTM), and of course AWM have all done so.

In the *Washington Post* on Sunday, October 4, there was an editorial with some guy saying in

by Anne Leggett. Thanks to the multitudes who corresponded with me about this.

effect "well, gee, math is hard, so why are they so upset?" And the Chicago *Tribune* contained a similarly enlightened editorial on October 5 called "Now Barbie is supposed to shut up." From the article:

> Now [Barbie] is under siege by the thought police.
>
> ... It is a well-known fact that math class is tough, and most kids have said the same thing at one time or another. But it has sent the American Association of University Women into a dither.
>
> ... This, of course, is one of those situations that is all in the way you look at it. It could be that Barbie is providing positive reinforcement. If girls find math is a struggle, and Barbie confirms that this is a common problem, they have no reason to feel inadequate.

So they can just give up then without feeling bad, I guess. And dream about being a doctor, who doesn't need to know any ugly old math, of course.

On the other hand, 10,000 seventh-grade students in Texas and Washington schools will discover this fall that learning math can be fun. GTE and the National Football League (NFL) are going to achieve that objective with a razzle-dazzle multimedia program involving football.

Called Project PASS, the program features "digitized NFL highlight video with the latest in consumer electronics, a Compact Disc-Interactive (CD-I) player." The program will concentrate on geometry and statistics, which are certainly challenging math concepts for seventh graders.

"We can no longer afford to have students learn mathematics as a set of rules to be memorized and that have no utility in the real world," said Dr. Jack Beal, associate professor of mathematics education at the University of Washington and the senior curriculum developer for Project PASS. "What makes Project PASS so special is that students can discover the relevancy of math in an application as familiar and fun as football."

Of course I have no quarrel with Dr. Beal's first statement. And I would guess that the program will be a big hit with seventh grade boys. But it's a shame that the project could not have included components based on women's athletics as well. Certainly the scoring in diving, gymnastics, or skating could provide statistics exercises as challenging as those involving pass completion percentages, while acknowledging that half the students in the math classes are female.

THE MILLS SUMMER MATH INSTITUTE: 1992

In the dictionary, closely following the word ardor, meaning enthusiasm or passion, is the word arduous, meaning hard to climb, or attended with great labor. A vital relationship between the two words, ardor and arduous, made itself manifest in the 1992 Mills Summer Mathematics Institute.

The Institute, organized by Leon Henkin, Lenore Blum, and Steven Givant, gathered twenty-five undergraduate women from across the country for an intense six weeks of mathematical experiences. The group spent the first four weeks at Mills College, then joined participants in the Professional Development Program for Minorities at University of California-Berkeley for the remaining two weeks.

Students met in a morning and an afternoon seminar on Monday, Wednesday, and Friday. The seminars offered were The Poincaré Upper Half Plane, Linear Optimization and Game Theory, What Is Number?, and Probability, led by Dorothy Andreoli, Lynne Butler, Svetlana Katok, and Deborah Nolan, respectively. In addition to introducing students to areas of mathematics they may not have seen previously, the seminars provided ample opportunity for growth in many areas: collaborative work, mathematical reading and writing, formulation of conjectures, individual research, and student presentations.

On Tuesday and Thursday mornings, students met with the seminar teaching assistants, women graduate students from Berkeley and Stanford. These sessions served a variety of functions — discussion of difficult problems, review of background material, problem-solving designed to reinforce ideas presented in seminar, and small-group work on projects.

A great "banquet" of mathematical ideas was "served" to the students in the form of colloquia which were presented every Tuesday and Thursday afternoon. Delectable "dishes" on the menu included Ergodic Theory and Dynamics, Knot Theory, Escher's Art and Lie Groups, Drawing Differential Equations, and Modern Logic. Students feasted on mathematics, and even developed a taste for certain topics, as their curiosity was kindled in the colloquia.

Curiosity about graduate school and careers in mathematics was satisfied as students attended three panel discussions on these topics. Moreover, the students had many opportunities to speak with professors, graduate students, and colloquium speakers.

While the daytime hours were filled with mathematical activities, the evening hours back at the dorm revealed the true spirit of the Summer Mathematics Institute: ardor and arduousness. A passion for mathematics was evident in the students as they labored to gain understanding of challenging topics and toiled with difficult problems. In a typical evening, one would see a small study group form in the library of the dorm while another met in the hallway. Often a third group gathered in the computer room to tackle problems together. Chalkboards inevitably were filled with mathematical scratchings; enthusiastic discussions of mathematics frequently continued into the wee hours of the morning. Glimpses into dorm rooms revealed students poring over books, deep in thought, grappling with problems or projects.

One professor and her husband (also a mathematician) made regular evening visits to the dorm to help students work on projects and to lead an additional study session on symmetric functions.

The shared enthusiasm for mathematics and intense efforts of all produced a new network of women mathematicians. As one student writes, "The Mills Summer Mathematics Institute was a tremendous experience — a summer filled with mathematics, learning, and discovery. The program was challenging, educational, and memorable. We had an opportunity to work with inspirational women professors, as well as to meet, study, and socialize with enthusiastic mathematics students. Our diverse group coalesced into a new network of women mathematicians which now spans the country." Another student states, "I will want to work with the friends and colleagues I've made this summer throughout my career."

A special thanks to those who made this life-changing experience possible: the National Science Foundation, Mills College, University of California-Berkeley, Leon Henkin, Lenore Blum, and Steven Givant. The academic enrichment and stimulation experienced by the participants in the Mills Summer Mathematics Institute will undoubtedly expand their educational and professional goals and opportunities exponentially!

by Anita Saluja, Lake Superior State University student and Pamela Deering, University of Michigan-Flint student (the youngest — age 16 — and oldest — age 38 — participants!)

1993 SUMMER INSTITUTES

The third annual Summer Mathematics Institute (SMI) at Mills College (June 19 – July 31, 1993) seeks applications from undergraduate women of all ethnic groups who are considering research careers in mathematics and related fields. Twenty students will be admitted to the 1993 program. Program organizers are Lenore Blum (International Computer Science Institute), Steven Givant (Mills College), Leon Henkin (UC Berkeley), and Deborah Nolan (UC Berkeley).

The fifth annual SMI at the University of California at Berkeley (June 19 – July 31, 1993) seeks applications from African-American, Hispanic-American, and Native American undergraduate men and women who are considering research careers in mathematics and related fields. Approximately 30 students will be accepted. The SMI is a cooperative project of the mathematics departments at UC Berkeley and the University of Texas at Austin. Program organizers are Professor Uri Treisman (Texas) and Professor Leon Henkin (UC Berkeley).

The Institutes are supported by a grant from the National Science Foundation. Each student will receive room and board, a $2,000 stipend and the cost of transportation to and from Oakland or Berkeley. Faculty members are asked to seek out candidates for the program and to encourage them to apply. All applicants must have completed with distinction at least one year of collegiate mathematics beyond freshman calculus by June 1993. In addition, applicants to the Mills program must have completed at least one course that involves extensive exposure to discovering and writing proofs.

Participants will explore in depth two areas of mathematics. Seminars of approximately twelve students each, taught by active research mathematicians, will encourage students to tackle challenging problems individually, in small groups, and in consultation with graduate student mentors. In addition, weekly colloquia will provide participants with a broad view of current work in mathematics. Lastly, informational workshops will assist students in making informed decisions about graduate school, give them current information about fellowship and financial aid opportunities to support their graduate studies, and make them aware of career opportunities for mathematicians.

The application deadline for both programs is February 12, 1993. Further information and application forms for the Berkeley program can be obtained by calling Olga Alvarez at (512) 471-3285 or writing to the Office of Special Projects, College of Natural Sciences, University of Texas, W.C. Hogg Building #204, Austin TX 78712; for the Mills program, by calling Kathy Guarnieri at (510) 430-2226 or writing to the Summer Mathematics Institute, Mills College, Oakland CA 94613.

1993 ATLAST WORKSHOPS

ATLAST is an NSF-ILAS Project to Augment the Teaching of Linear Algebra through the use of Software Tools. In five faculty workshops, participants will be trained in the use of the commercial software package MATLAB and will learn how to effectively incorporate computer exercises and laboratories into undergraduate linear algebra courses.

Participants will design computing exercises suitable for an undergraduate linear algebra class which they will class-test during the academic year following the workshop. A manual for attendees and a Project Book for the mathematical community will contain selected exercises submitted by the participants (contributions will be acknowledged).

ATLAST provides room and board for participants attending the workshops and a $200 stipend for submitted exercises. All teachers of undergraduate linear algebra courses at colleges or universities in the U.S. are invited to apply for the ATLAST workshops. The deadline for applications is March 12, 1993; late applications will be accepted on a space-available basis. Each workshop will be limited to thirty participants. A screening committee will notify applicants of its decisions by the beginning of April.

The project was conceived by the Education Committee of the International Linear Algebra Society (ILAS) and is funded through the NSF Undergraduate Faculty Enhancement Program. The Project Director is Steven J. Leon, University of Massachusetts Dartmouth.

For application forms or further information, contact Richard Faulkenberry, ATLAST Project Assistant Director, Department of Mathematics, University of Massachusetts Dartmouth, North Dartmouth, MA 02747; phone: (508) 999-8928; FAX: (508) 999-8901; email: atlast@umassd.edu.

BOOK REVIEW

Whose Science? Whose Knowledge? Thinking from Women's Lives. Sandra Harding. Cornell University Press, Ithaca, NY, 1991, xiv, 319 pp. $34.50; paper, $12.95.

This is an important book that has much to offer practicing scientists but probably will not be read by many of them. That is a shame, because its bold claims are usefully unsettling and its argument begs for engagement. One of the basic messages of *Whose Science? Whose Knowledge?* — that all fields of natural science are best analyzed from the within the social sciences, of which they are logically a part, rather than taken as external models for the social sciences — has potential consequences for most, perhaps all, scientific practice.

In 12 chapters divided into three sections, Sandra Harding, a philosopher specializing in epistemology, maps the relations between the development of powerful models and bodies of knowledge in Western science and the continuous creation and displacement of what she calls "others": parties often excluded from science and often objects of study, like Third World peoples, women, sexual minorities, the poor, and nature itself. By standing the hierarchical relationship between the natural and the social sciences on its head, Harding attempts to show that the much-debated objectivity claims of science are actually weaker in fields of natural science than they would be if the analysis of social contexts and interests were made a central part of scientific inquiry. In other words, by excluding the social relations and contexts of the scientific discovery process from scientific scrutiny, scientists end up with elaborate explanatory rationales but weakened understandings of causation. Were they to draw on recent developments in the critical social sciences, they would have both a stronger handle on the nature of their own knowledge and richer and more objective understandings of their objects of scrutiny.

Harding approaches this important claim through the following moves. First, she summarizes ferment

Reviewer: Rayna Rapp, Department of Anthropology, New School of Social Research, New York, NY 10003

around what she has earlier labeled (in the title of a 1986 book) "the science question in feminism": feminist (and allied) critiques of scientific objectivity have imputed a gendered or otherwise political nature to every aspect of the enterprise: who can become a scientist; what research projects get material and intellectual support; what "counts" as important, rather than marginal, science; and scientific findings themselves. By chapter 4, Harding asks her readers to understand "Why 'physics' is a bad model for physics," on the basis of a critique of objectivity as necessarily excluding (rather than more powerfully including) the social matrix within which its methods are developed. Illustrations of the "strong objectivity" that emerges when social context is included are most powerfully laid out in chapter 8, where Harding provides an extensive review of studies describing African-Americans' relation to the sciences. The experiences of black women doctors and nurses, the substandard science education available in most African-American communities, the lack of respect minority people have experienced in their encounters with the medical and health professions, and the use of racially marked language in scientific descriptions are all factors that have shaped the benefits and burdens of science for African-Americans. Bringing their criticisms and aspirations inside scientific investigation opens up new possibilities for research as well as for social justice. Later chapters make similar cases regarding the Third World, lesbians, and what Harding calls "more new agents of history and knowledge." In other words, learning to think from the perspective of excluded groups yields new insights into the process by which scientific questions are formulated, and, potentially, how scientists might best be recruited and taught to transform their research agendas.

There is a second epistemological argument that runs through the book: better science has already emerged and will continue to emerge from developments in "standpoint theory" than from more conventional notions of objectivity. Standpoint theory itself emerged from a critical, often Marxist-influenced philosophic tradition that saw the location of social actors as critical to the development of their particular scientific tools and methods. In standpoint theory, feminism develops from thinking through women's lives and experiences, but experience *per se* must be processed through reflection; it does not automatically yield insight. From this position, Harding works out an elegant argument

asserting that all of us can learn to think about the effects of sexism (or racism, or homophobia, or any other bias) like "natives" of the various minorities who initially mounted powerful criticisms of the effects of scientific exclusion on their lives and communities. In other words, male (or white, or heterosexual) scientists not only can but should use the powerful critical perspectives developed from excluded standpoints in the development of their scientific work. Some of this is heady stuff: the systematic comparison of standpoint theory with its Marxian roots and post-modernist transformations and the author's explanation of why some sciences move toward self-reflexivity (that is, self-awareness) more rapidly and successfully than others make for fascinating reading. But for those not already committed to a social constructionist worldview, much of the book may seem rhetorical, and the repetition of a small number of examples drawn from a limited range of epistemological texts made me yearn for a broader and more challenging array of criticisms.

Above all, the insistence that the social sciences provide a more powerful model of epistemology than the natural sciences may not persuade non-philosophers, because Harding scants the hardest cases that might challenge her claims. When examples are drawn from applied fields that intertwine with the biological sciences, it is relatively easy to see what anthropologist Leila Leibowitz once called "the Disneyization process" at work: our genes, hormones, organ systems, and the like are all too easily characterized in comfortably anthropomorphic terms. Social studies of science effectively describe how culturally embedded scientific worldviews and explanations can be. Recent studies of primatology, for example, highlight the central importance of race and gender categories in the development of scientific thinking about monkeys and apes; military models loom large in the language of contemporary immunology. (See for example Donna Haraway, *Primate Visions* [Routledge, 1989] and "The biopolitics of postmodern bodies: determinations of self in immune system discourse," *Differences* 1, 3 [1989]; and Emily Martin, "Toward an anthropology of immunology: the body as nation-state," *Medical Anthropology Quarterly* 4, 410 [1990].) Such examples gracefully sustain Harding's perspective.

The arguments for social construction are harder to sustain in sciences less obviously about human beings and our (limited) agency, such as physics, chemistry, astronomy, or geology. Why should a chemist accept the assertion that the periodic table is gendered and racially marked? Why should a physicist rethink "his" commitment to quarks just because a philosopher alleges that the small scientific elite responsible for their discovery systematically overlooked other explanations as a result of its social standing? (Though recent social studies of science *do* claim to have located cultural processes, rather than unmediated natural ones, at the heart of what the "hard" sciences study; see for example Sharon Traweek, *Beamtimes and Lifetimes* [Harvard University Press, 1988] and Karin Knorr-Cetina and Michael Mulkay, Eds., *Science Observed* [Sage, 1983].) Though Harding provides a logical argument against distinctions between applied and pure, natural and social, and "softer" and "harder" sciences as themselves hierarchical social constructions, only those of us already committed to this position are likely to take her word for it. A deeper engagement with these tough cases would have made the book more useful to audiences beyond those already well read in feminist epistemology.

Still, what is most compelling about *Whose Science? Whose Knowledge?* is its belief in the power of democratizing scientific personnel, subjects, and objects. In the late 20th century, "we" are all inside science: women, racial and sexual minorities, inhabitants of the most underprivileged (as well as what Harding labels the "overprivileged") parts of the globe. People whose standpoints develop out of these diverse experiences must be recruited into setting and carrying out scientific agendas not only for reasons of justice, but for what they can contribute to scientific practice. That's a large and utopian agenda whose fulfillment should benefit everyone.

Do you know a great elementary or secondary school teacher? Nominations for the 1993 Presidential Awards for Excellence in Science and Mathematics Teaching Program are due December 1, 1992. The winners serve as models for their colleagues and help form a leadership core to advance the major reform movements in science and mathematics. For information and forms. call Barbara A. Smith, PAESMT Project Coordinator, at (703) 243-7100, ext. 129.

NSF GRADUATE FELLOWSHIP PROGRAM

We have just served on the panel which awards NSF Graduate Fellowships in mathematics. Part of the purpose of this letter is to explain the selection process to the mathematics community, especially to potential applicants, advisors, and writers of letters of recommendation.

I.   The mathematics panel reviewed 257 applications for 26 awards. The number of awards in a given discipline is roughly proportional to the number of competitive applications in that discipline. In other words, to a certain extent, we would have more awards in mathematics if more students applied. Physics and chemistry each had almost twice as many applications as mathematics, with a correspondingly greater number of awards; there were 7,723 applications in all fields.

II.   In view of the large number of highly qualified candidates and the small number of fellowships, the award of "honorable mention" should be viewed as a competitive recognition of significant achievement.

As an illustration of the quality of the applicants for mathematics, fifteen percent had perfect GRE subject test scores and 3.5 per cent (nine) had perfect scores on all four parts of the GRE. (Scores on these exams are just one consideration; letters of recommendation, grades and individual student statements are also very important.)

III. Carefully written and appropriate *letters of recommendation* are extremely helpful in the evaluation process. In particular, comparisons between two or more applicants make the panel's job easier, and comparisons to successful mathematicians at a similar stage of development are especially influential. Students should be advised that letters from scientists other than mathematicians tend to carry less weight and letters from non-scientists carry virtually no weight at all.

IV. The mathematics panel found *research experience* desirable but did not consider it essential to a successful application. Many of the applicants have been through one of the Research Experience for Undergraduates programs sponsored by the NSF; several have even published papers.

The NSF Graduate Fellowship Panel
Sylvia Weigand, Chair

The panelists viewed rambling and unfocused statements (under career goals, research experience) as detrimental. It is best to be concise and to the point. Panelists must review many applications in a short time, and information buried in long-winded statements will most likely be overlooked. Applicants should play to their strengths; all relevant experiences should be mentioned.

V.   First-year graduate students may apply, as well as senior undergraduates. There are fewer of the former than might be expected — just 64 this year, and seven of them received awards. Possibly the graduate students have difficulty finding letter writers at their new institutions. It may be that the fellowships should be better advertised to this group; faculty should be encouraged to bring the fellowships to the attention of their advisees/ students.

VI. In its announcement for the competition, the NSF encourages applications from members of minority groups, women, and persons with disabilities, although the panelists are expected to disregard race, sex, and handicap in their deliberations. There is a separate program for minority fellowships. (Many students compete in both.) There is a separate program for women in engineering. There is also additional financing for persons with handicaps who are successful (defined to include honorable mention) in the initial competition.

However, there is no special program for outstanding women in mathematics. The panel wondered if such a program might be initiated for women in mathematics, because (1) there are still various barriers which put women at a disadvantage in this competition and (2) we feel that additional incentives for women would inspire more women to pursue mathematics.

The panel has noticed that women may not do as well in our evaluation process due to a number of factors: perhaps they have had a harder time finding mentors for research projects, women often score lower than men on tests (although they may have better grades than men), and references may be written with a bias towards men. The panelists are sensitive to these problems, but have not felt that women's applications should be evaluated differently from men's. The panelists would like to see extra fellowships set aside specifically for women. We need more highly qualified women graduate students, more women writing excellent Ph.D. theses, and more women with outstanding careers in mathematics.

There were fewer female applicants this year (83) than last year (90), although overall the number of applicants went up (257 applicants this year versus 222 last year). This year only three fellowships were awarded to women in mathematics; last year ten were awarded to women. (Last year there were 32 awards in all, whereas this year there were only 26.) The picture in computer science and in applied mathematics is equally bleak — last year five fellowships went to women in computer science, this year, two; last year four went to women in applied mathematics, this year, three.

Note: If mathematicians and others are interested in an extra program for women, they should write to Dr. Terry Porter, Division Director for Research Career Development, and to the Division Director for Mathematical Sciences. (Presently that director is Dr. Judith Sunley; for the next few months it will be M. Kent Wilson on an acting basis; after that, another individual will be named to the position.)

VII. The panelists present the NSF with three unordered, alphabetized lists. All the applicants in the first list and half the applicants in the second receive awards. The awardees in the second group are chosen by the National Science Foundation, based on geographical and other considerations. This year the first two lists comprised six and eight percent of the applicants. The third is for those who will receive honorable mention along with those in group two who don't get awards.

VIII. In giving these details, we are concerned that mathematics faculties should not discourage good mathematics students from applying for an NSF Graduate Fellowship. We submit that it is beneficial for our profession and for students to go through the process of applying, even if the application does not result in an award. We hope faculty will explicitly encourage students who are considering graduate school to apply. This would yield: an early opportunity to think about graduate school, an early opportunity to refine thinking about what one wants to accomplish in graduate school, and experience in writing about oneself and one's goals with respect to mathematics.

ON WOMEN'S MATH ACHIEVEMENT: Part 3 of 3

Conclusions and Future Directions

Given girls' better math grades, why do they take advanced math classes at lower rates? In other words, why do girls' better grades not make a difference in their mathematics participation? Each of the hypotheses in the previous section can be applied to these questions. Girls' lesser experience with extracurricular math and science as well as a presumed rote approach to learning math may reduce both their confidence and their motivation for choosing math courses. Also, future math classes may be viewed as novel tasks with a high risk of failure, so even though one has done well in current courses, this experience may not seem applicable to future courses.

Two factors may mediate the process whereby high grades in current math courses do not lead to taking future math courses. The first is the tendency of girls more than of boys to attribute success in math to effort rather than to ability (Deboer, 1986; Fennema, 1985a; Lyons-Lepke, 1986; Mura et al., 1987; Ryckman & Peckham, 1987; Stipek, 1984; Wooleat et al., 1980), especially among high-achieving girls (Licht & Shapiro, 1982, cited in Licht & Dweck, 1983). One result of attributing success to effort is that although one can be sure that the effort was enough in this situation, it may be difficult to believe it will be enough for novel situations such as future math courses. Furthermore, perceptions of high effort in an achievement situation that involves comparison of one's performance to that of others implies that one has lower ability in that area, at least in relation to someone who does as well or better with less effort (Nicholls, 1976, 1984). Ability, on the other hand, is popularly thought of as a quality that is sufficient to deal with present as well as with future

situations. The consequences of making effort attributions for success may be more debilitating for girls' mathematics confidence than for their confidence in other academic areas. Girls are more likely to use effort attributions for success in math than in language arts (Ryckman & Peckham, 1987). Furthermore, math more than English (Eccles et al., 1984; Ruthvan, 1987) and more than science (Ruthvan, 1987) is perceived as a subject in which success is linked to ability more than to effort. What happens as a result is that girls' experience with success does not increase their confidence for future challenges. Singer and Stake (1986) found that men's but not women's general performance self-esteem was enhanced by participation and success in math courses in high school and college. Eccles (1986) found that math-able college women who were pursuing math-related careers were more likely to attribute their math success to stable internal causes than were equally math-able women pursuing other careers.

The second factor is sex-role conflict. Sex-role conflict can result both from discrimination against girls' and women's participation in math and from perceived or experienced conflict between parental and career goals. Discrimination occurs at many levels and in both subtle and not-so-subtle forms. Girls are sometimes directly discouraged from gaining mathematics training. For example, half of the girls participating in a special SMPY accelerated program encountered resistance to their request to enroll early in Algebra II (Fox, Benbow, & Perkins, 1983). Women mathematicians report that as they engaged in more advanced levels of study in mathematics, they were more likely to be actively discouraged from pursuing math as a career (Luchins & Luchins, 1980). Women's achievement is sometimes treated in a trivializing manner. For example, adults asked different questions of a gifted Grade 6 girl who had built a robot. Women asked questions about her design, where she had gotten the parts, and where she got the idea. In contrast, the first or second question asked by all male visitors (and never by a female visitor) was, Did you build it to do housework? (Reis, 1987). Discrimination may also take more subtle forms. The finding that boys more than girls experience more social, joking, and nonacademic conversations in the high school mathematics classroom (J. R. Becker, 1981; Mura et al., 1985) may communicate to young men and women that this is an environment where men belong more than women do. Although

neither sex highly stereotypes math as a male domain, men typically stereotype it more than women (Collis & Williams, 1987; Fennema, 1980, 1983; Fennema & Sherman, 1977; Sherman & Fennema, 1977; Swafford, 1980). That their male peers stereotype math more than they do may create in women an uncertainty about their place as women and as mathematics achievers (Fennema, 1980). Women mathematicians report that a common sexist attitude they encounter is the idea that women mathematicians are not feminine (Ernest, 1976).

The second source of sex-role conflict is in the perceived or experienced conflict between career and parental goals. Young women continue to expect to be employed part-time or not at all when their children are young, and young men expect that they but not their wives will be employed full-time when they are fathers of young children (Mura et al., 1987; Sherman, 1983; Tittle, 1986). College women value their future roles as mothers very highly. When asked to rate a series of occupations including mothering, they rate mothering in comparison to other occupations as being moderately difficult, having the highest probability of success, the highest importance of success, highest effort required, highest positive affect associated with success, and the highest negative affect associated with failure (Eccles, 1986). Mothering is an extremely important role, and an occupation that is perceived to be threatening to the success of mothering will probably not be attractive. Careers that require many mathematics courses may be perceived as requiring a full-time involvement, and that may be perceived to threaten success at mothering. Young women planning careers who are concerned about possible conflict between mothering and scientific career goals are not being unrealistic. Female mathematicians report more conflict between family and career than do male mathematicians (Luchins & Luchins, 1980). Women in mathematics doctoral programs worry most that their graduate training may take away from their involvement with family, friends, and other interests. In contrast, their male peers worry most about professional status and their mentor's estimates of their abilities (Maines, 1983, cited in Eccles, 1987). Older female engineers are twice as likely to be childless as older male engineers (Jagacinski, 1987). Highly creative female mathematicians in comparison with female mathematicians of average creativity are distinguished by their willingness to subordinate other activities to

professional goals. Highly creative male mathematicians differ from their average counterparts in their desire to accomplish great things and achieve fame (Helson, 1980). Perceptions of future conflict may well lower the perceived usefulness of future math courses to women even though they have high grades in current math courses.

What action can be taken on the basis of girls' higher grades? It is important that teachers, parents, researchers, and young women themselves take their good math grades seriously. This article is, I hope, a first step in this process. Grades are an important measure of achievement. They cannot replace standardized tests that allow comparisons across populations, but they can be used in addition to standardized tests. Furthermore, they can be interpreted as an indicator of young women's future potential to do well in math and succeed in math-related careers. It may be particularly important to use girls' better math grades to change parents' attitudes about the value of math for their daughters and their daughters' ability to do math. Parents' attitudes about their daughters' and sons' mathematics participation and skill vary systematically. Given equal mathematics performance, parents of daughters more than parents of sons believe that their daughters must work harder at math, that math is more difficult for them, and that math is less important for them (Parsons, Adler et al., 1982). Similarly, mothers of daughters in comparison with mothers of sons are more satisfied with their daughters' math performance (given equal performance) but expect less of their daughters in terms of future schooling (Holloway, 1986). Parents' expectations for their daughters' and sons' future career plans also reinforce the expectation on the part of girls that they will pursue careers part-time or not at all when they have young children (Brody & Fox, 1980). Parental attitudes are significantly correlated with their child's self-perception of math ability as well as with their child's math performance (Parsons, Adler et al., 1982). Thus it appears that grades affect subsequent math performance through their effect on parental attitudes, which in turn affect student attitudes and behavior (Eccles & Jacobs, 1986).

> *It is important that teachers, parents, researchers, and young women themselves take their good math grades seriously.... Grades are an important measure of achievement.*

Furthermore, parental attitudes are influenced by media reports. Mothers of daughters who read popular media reports of the Benbow and Stanley (1980) study in comparison with mothers who had not seen such reports felt that their daughters had less math ability and a lower chance of future success in math, that math was more difficult for their daughters, and that their daughters had to work harder to do well in math. In contrast, fathers of daughters who had read popular reports perceived their daughters' math ability as higher than when they had rated it prior to media exposure. On the other hand, fathers of sons exposed to media reports were more likely to rate math as more important for boys and to perceive girls as less able in math than were fathers of sons who had not seen the media coverage (Eccles & Jacobs, 1986; Jacobs & Eccles, 1985). Thus it may be possible to use information about girls' superior math grades to convince parents of their daughters' math potential, which may in turn increase girls' self-perceived math ability, performance, and course taking.

Girls' higher math grades may also lead to a reevaluation of some common underlying assumptions in the area of sex-related differences in mathematics achievement. Because the literature has focused on girls' poorer performance on standardized tests, it has also been assumed that girls' presumed preference for a rote learning style or familiar performance situation is disadvantageous. However, if these preferences facilitate girls' performance on classroom exams, perhaps we should reevaluate our judgments. Indeed, boys' autonomous learning style or lack of motivation to do well on familiar tasks may be problematic in some situations. Perhaps what is most needed is an increased flexibility on the part of both boys and girls so that they may perform optimally across a wide range of achievement situations, as well as increased flexibility in our views of mathematics achievement in order to accommodate the different strengths that each sex brings to the study of math.

About 140 references, 1974 to 1988, are given. I refer you to the journal, as the list is too lengthy to include here.

EDUCATION COMMITTEE

The past 20 years have seen decreasing gender differences in occupations and industries and, particularly in the 1980's, increasing relative earnings for women. Women's participation in the labor force also has continued to increase, as they have become more likely to work over most of their adult lives....

Overview of trends

In recent years, both white and black women have narrowed the earnings gap relative to men of the same race. For white women, the annual earnings ratio ... rose from 60 percent in 1974 to 74 percent in 1988. For black women ..., the same ratio rose from 68 percent in 1971 to 86 percent in 1988.... In addition, although the earnings of black men and women stagnated relative to whites of the same sex during the 1980s, black women continued to narrow the gap with white men over this period. Occupational differences between males and females also narrowed over the 1970s and 1980s.... Women made particular progress in entering traditionally male managerial and professional jobs....

Determinants of the Gender Earnings Gap

Traditionally there have been two primary explanations for the gender gap. First, women suffer from discrimination in the labor market. Second, because many women work part time, or drop out of and then reenter the work force, they have less human capital [education, skills, work experience] and are less productive than men of similar age and education. Both discrimination and differences in human capital affect the pay gap, although precisely determining the relative importance of each is difficult....

[M]y current work with Lawrence M. Kahn on international comparisons of the gender gap suggests that an additional factor, wage structure, is of considerable importance in explaining differences across countries....

Francine D. Blau (University of Illinois) is doing research on sources of and recent trends in gender differences in economic outcomes and the social consequences of changes in gender roles. The following column is excerpted from her research summary "Gender and Economic Outcomes," NBER Reporter, *Spring 1992, pp. 4-7, National Bureau of Economic Research, Inc.: Cambridge MA.*

Using microdata from nine industrialized countries, we find that wage structure is an important determinant of cross-country differences in the gender earnings ratio. Specifically, the higher level of wage inequality in the United States increases the gender differential in the United States relative to all other countries in our sample. Most strikingly, wage structure fully accounts for the lower gender earnings ratio in the United States compared to the Scandinavian countries and Australia (the countries with the smallest gaps). This explains the seemingly paradoxical position of U.S. women compared to women elsewhere. U.S. women compare favorably to women in other countries on several measures of skill relative to men. Moreover, the United States has had a longer commitment to equal pay and equal employment opportunity policies than the other countries in our sample. Yet the gender pay gap in the United States is considerably larger than in the other countries in our sample.

A variety of factors may explain the higher level of wage inequality in the United States, but we see the wage-setting institutions of each country as being particularly important. Centralized wage-setting institutions, which tend to reduce ... wage variation and often are associated with conscious policies to raise the relative pay of low-wage workers (regardless of gender), may reduce the gender pay gap indirectly. U.S. pay-setting is far less centralized that that of virtually all of the countries in our study, with the possible exception of Switzerland.

Understanding the Trends

...That women's relative earnings did not decline ..., but rather increased somewhat during this period, may reflect a reduction in labor market discrimination. This, in turn, may be a result of the government's antidiscrimination efforts, which may have been more successful than generally recognized. In addition, education differences between men and women declined over the decade as an increasing percentage of women enrolled in college and professional schools, especially in traditionally male fields of specialization.

...[W]omen who entered the labor force during the 1970s did not stay home to raise their children, as their mothers did. As a result, women's average experience levels began to rise relative to men's during the 1980s. Gender differences in level and type of education continued to narrow.

A Look at the Future

Recent increases in the labor force participation of women, and a growing tendency of women to remain employed more continuously over the life cycle, have meant that a rising percentage of young children have mothers who work outside the home. There is every indication that this pattern will persist into the future and that younger women will be more firmly attached to the labor force than their predecessors were. Adam J. Grossberg and I have examined the impact on the child's cognitive development of maternal employment during the first three or four years of a child's life, as measured by standardized test scores....

Our study suggests that the employment of mothers of young children has little effect on their cognitive development. If, however, maternal employment has any deleterious effects, they are most likely centered on the first year of life. Public policies designed to improve the quality of alternative care during this time, and/or to encourage greater opportunities for parental leaves during this period, might offset these effects. With or without government mandates, however, as more women with young children work and as men play a greater role within the family, an increasing number of employers are finding it profitable to develop benefits and policies that assist workers in balancing job and family responsibilities.

Any comments? Write to: AWM Education Committee, c/o Sally I. Lipsey, Chair, 70 E. 10th Street, #3A, NY, NY 10002.

AMS ELECTION STATEMENTS

Vice-Presidential Candidate: Anil Nerode, Professor, Cornell University

This statement appeared in the September 1992 issue of the *Notices* of the AMS: If elected, I would help AMS take a lead in: (1) promoting the unity of the mathematical sciences; (2) integrating mathematics with the rest of scientific life; (3) making contributions of mathematics to government, business and industry known to the Public and Congress; (4) integrating the teaching community with the research community; (5) identifying the mathematically talented among minority groups and women, drawing them into our community. Besides a long research career under NSF, ARO, ONR, AFOR, and many other sources of research support, I have: had thirty-four Ph.D. students, including Louise Hay and Charlotte Lin (I joined AWM at its inception); run MAT programs (NSF); been consultant for MAA for about eighty colleges; initiated a freshman program to hold students in mathematics (EXXON); initiated a program to bring college teachers into the University for updating (PEW, DANA); initiated many dozens of conferences in new areas (MSI); been a consultant for EPSCOR Kentucky and Puerto Rico; initiated cooperative research programs with minority institutions; advised many government and industrial laboratories and institutes. I have also worked with EPA for fourteen years, have been on the U.S. Environmental Protection Agency Science Advisory Board, and am currently Chair, USEPA Global Change Program Technical Advisory Panel.

For the newsletter, he adds: I am especially concerned with the apparent inability of both the federal agencies and the technical societies, including AMS, to set up realistic minority and women's programs to attract these groups into the profession. I have a lot of experience that most mathematicians do not have in dealing with cabinet-level policy issues for various federal agencies, and I would appreciate the opportunity to make a try under the color of the AMS.

Candidate for Editorial Boards Committee: Fan R. K. Chung, Bellcore Fellow, Visiting Professor at Harvard University

We are today in the midst of a technological revolution. Mathematics will play a vital role both in laying the foundation for this process and in making crucial contributions throughout the whole spectrum of this development. The AMS, as the major organization for fostering mathematics research, has a special responsibility to maximize the impact of mathematicians and to attract the best talent, including, in particular, women and minorities. The publication program of the AMS is a primary vehicle by which it serves its members as well as the world mathematical community. It is therefore important that editorial boards of the AMS journals reflect the broad spectrum of AMS members and their interests.

ICMI STUDY: GENDER AND MATHEMATICS EDUCATION

The study proposed in this discussion paper is based on a simple premise: there is no physical or intellectual barrier to the participation of women in mathematics, science, or technology. Having said this, we must ask ourselves: why don't they participate more? Here there is no simple explanation. For if there are no physical or intellectual barriers, there must be social and cultural barriers that account for their underrepresentation. For the most part, these barriers have not been raised intentionally. They are an integral part of a social order that carries with it discrimination. The perspective of this study is that discrimination on the basis of gender is no longer acceptable. Judge Rosalie S. Abella, an advisor to the Ontario government, has posed the problem as follows:

> Systemic discrimination requires systemic remedies. Rather than approaching discrimination from the perspective of the perpetrator and the single victim, the systemic approach acknowledges that by and large the systems and practices we customarily and often unwittingly adopt may have an unjustifiably negative effect on certain groups of society. The effect of the system on the individual or group, rather than its attitudinal sources, governs whether or not a remedy is justified.

> Remedial measures of a systemic and systematic kind are meant to improve the situation for individuals who, by virtue of belonging to and being identified with a particular group, find themselves unfairly and adversely affected by certain systems of practices [CAUT (Canadian Association of University Teachers), 1991, *Status of Women Supplement*, p. 12].

Statistics on the participation of women at the tertiary level in general and in mathematics, science, and technology in particular strengthen the case for a social, systemic viewpoint. We have to ask why women specifically avoid mathematics and sciences. Taking Canadian data as an example, we note that while women are attending universities in unprecedented numbers (and earning more than 50% of all bachelor's degrees in Canada), they are overrepresented in the humanities and underrepresented in mathematics and science. The proportion of women undergraduate students in the mathematical and physical sciences increased from 19.4% to 28.5% in the years 1971-1987, and in the engineer-ing and applied sciences it increased from 1.2% to 12.2%. This constitutes very modest progress when one compares it to the progress women have made as students in other traditionally male-dominated professions. Over the same period (1971-1987), the proportion of women among those obtaining a bachelor's degree in law increased from 9.4% to 46.7%, while the proportion in medicine went from 12.8% to 41.7%. At the doctoral level, though women have increased their participation, they are still underrepresented in mathematics and science.

Two decades of research on the problem of gender imbalance in higher mathematics and in mathematics-related careers have consistently found that when gender-related differences in achievement are present they are rather small. Or put in other terms, achievement *per se* does not account for the large discrepancies in enrollment in higher level mathematics courses and in the election of mathematics-related careers. This finding is perplexing in light of what we find in the media on girls and mathematics and science.

In the United States and Canada, and in other countries as well, a lot of publicity has been given to girls' supposed inferiority in these subjects. Articles have appeared in popular magazines claiming that women are inferior in what they have referred to as "cognitive abilities," "spatial skills," or "aptitude for mathematics." It has also been claimed that women are incapable of grasping mathematics or science because they are "emotionally minded." It is hardly surprising that such messages in the popular press influence girls to believe in their inherent inability to succeed in mathematics, and thus discourage them from taking up mathematics or other branches of science.

Such claims are usually based upon studies of achievement. Yet, as stated above, most studies that have found achievement differences in favor of boys have found very small differences that are not educationally significant. The more important point is that the popular press, and indeed many of the researchers, have confounded achievement with aptitude, ignoring other factors. The truth is that we do not really know how to measure aptitude, or even whether aptitude alone is a determining factor in achievement. Some research suggests that learner's attitudes towards learning and their career aspirations are powerful determinants of achievement.

While studies that show lower achievement for girls often receive wide publicity, studies that show the opposite may not. Research on the International Educational Association (IEA) mathematics results from 20 countries at the Grade 8 level (age 13) shows that boys and girls are about equal in achievement, and that the differences among countries are much larger than any differences within countries [Hanna, Gila (1989): Mathematics achievements of girls and boys in grade 8: Results from twenty countries. *Educational Studies in Mathematics* 20, 225-232].

Another study which challenges the popular notion of girls and lower mathematics achievement is one by Alan Feingold [(1988): Cognitive gender differences are disappearing. *American Psychologist* 23 (2), 95-103]. In reviewing the research results on cognitive gender differences for a period of 30 years in the United States, Feingold shows that differences had actually declined over the three decades preceding his study. Clearly the research message is that the problem of gender differences and mathematics achievement, and on gender-based inequities in mathematics-related careers, is a socially constructed one.

At the same time numerous studies have been done which indicate what can be done at the level of societies and of education systems to counteract the development of gender inequities. This discussion paper is an attempt to summarize key questions in one segment of the literature on retaining girls and women in mathematics and science — namely, analyses of gender issues in mathematics education. It is hoped that the identification of the relevant questions will focus attention on key gender-related issues in mathematics education for the 1990s and beyond.

Attitudes: Femininity and masculinity are socially developed constructs which are reinforced by the interactions of children with each other and with adults. Implicit and explicit assumptions and messages about female and male intelligence, needs, and inclinations seem to affect attainment in mathematics. To a certain extent, gender differences in mathematics performance might be a reflection of differences in attitudes towards mathematics.

Girls tend to avoid mathematics courses when they are no longer compulsory. It appears that the attitudes females have towards mathematics, their feelings as learners of the subject, and the values that shape their attitudes determine whether or not they persist in mathematics course-taking. Girls who are aware that mathematics will be relevant to their lives and useful in their future careers are far more likely to remain in mathematics courses.

The larger question in this context pertains to socialization. What is its role in the observed differences in attitudes towards mathematics? More specifically, the following questions are helpful: Is there an implicit message in society that competence in mathematics is more important for the attainment of boys' career ambitions than it is for girls? How can we increase the confidence of females in their ability to do mathematics? Do specific teaching approaches and learning modes lead to more positive attitudes to mathematics? How does understanding the similarities between male and female achievement and attitudes help practitioners establish a basis for resolving inequities?

Culture: Ethnomathematics recognizes the influence of sociocultural factors on the teaching and learning of mathematics. Documentation exists that emphasis placed within schools on the application of mathematics differ markedly within countries and from country to country and that this emphasis affects student performance. We have much to learn from this research: How informative are, or what do we have to learn from, international performance comparisons? Are there cultural patterns, such as social customs, family customs, customs in our educational system, and customs specific to mathematics, that discourage girls and women from pursuing mathematics? What difficulties in mathematics do males and females from minority groups face? What methods of encouraging, recruiting, and retaining women and minorities are used by different cultural and national groups?

Mathematics as a discipline: Recently, the existence of gender biases in the practice of mathematics has been studied extensively from several different perspectives including a feminist one. Some essential questions are: What are the consequences in the theory and discourse of mathematics of the fact that it was constructed in predominantly patriarchal societies? Does the nature/structure/language of mathematics have a bias that promotes gender imbalances? What is the nature of the different areas of mathematics that appears to encourage (or not, as the case may be) students to persevere? What features of mathematics as a discipline (e.g., the contribution it can make to developing creativity and enjoyment, and its value in developing reasoning powers) can be emphasized to make it more relevant to both genders?

Jobs and careers: Historically women have been seriously underrepresented in mathematics and related fields. This does not appear to be due to lower levels of achievement. Gender-related differences in mathematics achievement, when they are found, are very small and thus do not account for these large participation discrepancies. Even though more women have chosen to pursue careers in mathematics and science in the last decade, there is still a concern over their low representation in mathematics, engineering, and the natural sciences.

Educators need to pursue an understanding of the factors that account for the discrepancies in involvement in higher level mathematics courses and to develop strategies that will help both genders stay in mathematics courses and thus keep open the full spectrum of career and job options. Research still needs to be done around the following questions: Do social perceptions (media, publicity, etc.) discourage girls from choosing careers that require mathematical skills? How can (female) students be helped to see that mathematics can also contribute to the solution of problems which they will meet out of school and to job opportunities? Should the privileged position of mathematics as a screening device for professions be challenged? Why hasn't the preparation in mathematics translated into greater numbers of female science and engineering majors? How can the visible proportion of women in mathematics and related fields be increased so that these options and occupations become part of female students' accepted range of choices? How can women's opportunities for careers in scientific and technical professions be expanded? Conversely, should women go into mathematics-related fields given the nature of the present system?

Girls and technology: The technological environment can, and does, affect student attitudes and their conceptions of what comprises desirable knowledge and understanding. In 1990, Ursula Franklin noted that the practices used in technology define its content and "when certain technologies and tools are predominantly used by men, then maleness becomes part of the definitions of those technologies" [*The Real World of Technology CBC Massey Lectures*. CBC Enterprises, Toronto and New York]. As a result, many female students do not appear to hold a worldview which includes technology as relevant to their lives or as appropriate for them.

Few educators would disagree that schools must be more responsive to the science/technology thrust of our contemporary world and to the related educational needs of all students. However, international investigations have noted consistent gender inequalities in technological education. Important questions for educators to discuss include: How does the considerable and growing impact of technology on schools and its changing role affect the education of females? How can we foresee and influence how technology changes their education? Can we influence the designers and producers of technology, and hence how girls are educated, by setting technological goals (e.g., development of technical hardware for educational purposes)? How are the areas of computer studies and mathematics to be made more relevant/accessible to girls? How can the computer be used as a learning and teaching aid? What are the effects of certain implementations on the cognitive development of the learner? What are the epistemological changes due to the use of computers?

Curriculum: To achieve gender equality in mathematics education, educators need to look at the development, content, and presentation of the mathematics curriculum within its general educational context.

In this regard it is helpful to find examples of success in teaching mathematics to all students (and to be aware of criteria used to denote the term "success") and to learn from these successes. Some worthwhile questions for consideration are: Given the pattern of lower rates of female participation in elective mathematics courses, and the fact that mathematics is critical to careers at technical, professional and managerial levels, to what extent would it be appropriate to make mathematics a compulsory subject in schools? What would a gender neutral curriculum and pedagogy look like? Would single-sex education benefit students who tend to opt out of mathematics? Should different mathematics curricula be provided for different groups of students? Does the mathematics curriculum fail to deal with topics of particular concern to girls and women? Why do specific mathematics topics seem easier to one group of students than another? What are the essentials which must be contained in mathematics curricula? How can different components of curriculum — instructional methods, assessment programs, and resources produced by teachers and by publishers — be designed so that the development of mathematics skills and knowledge becomes a prime aim for all children? How can the pace and range of work in the

mathematics classroom be adapted to allow for increased understanding by all students? Does the mathematics curriculum necessarily have to be so overloaded that the quantity tends to control the pedagogy?

Assessment: Assessment is a crucial component of mathematics education. It functions to provide information to assist in decision making about individual students, classes, teachers, programs, or institutions. The kind of information sought, how it is gathered, and the form in which it is reported, all have a bearing on mathematics education.

Major challenges and questions exist within the realm of assessment as it relates to gender issues. A critical question is whether mathematics is taught equally well to different groups of learners. Important queries within this larger question include: What is mathematical ability and how can it be measured? What kinds of mathematical tasks are being assessed (short technical exercises, long tasks, extended problems, etc.)? Are the methods of assessment used more favorable to certain groups of students? How can we ensure that classroom materials and exam questions properly reflect gender equity? Should they include a wider range of human activities and interests than traditional materials and examinations? Is the range of experiences provided in the mathematics classroom (or elsewhere in the school) biased in favor of one group of students to the possible detriment of others? Are there examples of assessment practices which are known to have a positive or negative influence on instruction? What aspects should be maintained and encouraged? Are there examples of assessment practices which negatively influence instruction; for example, by focussing instruction on assessment and tests rather than on more general goals? How do different assessment modes influence the social environment in the classroom?

Teachers and the school: Teachers are one of the most important educational influences on students' learning of mathematics. The school environment or social context in which students learn mathematics is another critical factor, influencing how they learn, their expectations, their perceptions and misapprehension of mathematics and of schooling in general. More research is needed on how the ethos of the school and individual teachers shape or alter student attitudes towards mathematics.

With respect to teacher education, the general question remains of how to make teachers at all levels aware of, and hence how to eliminate, any gender bias in their current practices. We need to ask the following questions: Do we need to improve in-service training? Should we increase incentives to groups to participate and the amount of time we spend on the topic of gender awareness? Should more research be focussed on teachers — their conceptions of their roles both in the classroom and in society, their understanding of the educational process, their methods and teaching aids?

Research has been done on the critical factors in the school environment which reduce retention of females in mathematics courses. We need to ask: How can pupils' (particularly girls') self-confidence in mathematics be increased? How can the learning climate for girls be improved? Does the learning climate for girls improve within single-sex settings? How can modes of classroom organization and teacher-pupil interactions be encouraged and developed which would benefit all children?

Working with parents: Sex-role stereotyping begins at birth. This stereotyping is reinforced as the child progresses through school by the differential expectations and treatment of boys and girls by teachers, counsellors, parents, peers, and also through instructional materials and the media. It is known that parents and educators can intervene to modify the influence of sex-role stereotyping and to provide an equitable education for all students.

Also, researchers have studied how parental educational and occupational levels affect their children's mathematics learning. And so the basic public and community issues pertain to how the dual disadvantage of sex-role stereotyping and social class can be overcome. More specific questions include: How can parents be sensitized to ways they can encourage and support their children in mathematics/science fields? How can public awareness be increased, especially among parents, teachers, counsellors, of the advantages of mathematics-related careers for women and their achievements in mathematics? How can schools take responsibility for informing the community about the importance of girls' participation in mathematics? How can the commitment of national and local governments to supporting mathematics education for girls and women be increased?

SIAM PHOTOS

Alice Schafer, Jodi Beldotti, and Schafer Prize Winners

Zvezdelina Stankova

Martha Mancewicz and Laura Hegerle

Pamela Coxson and Deborah Hack

Edith Luchins, Mary Joyce, and Gertrude Kraut

Alice Schafer and Ann Stehney

Joyce McLaughlin

Suzanne Lenhart and Alice Schafer

ANNOUNCEMENTS:

UNIVERSITY OF CALIFORNIA - OAKLAND - PRESIDENT'S POSTDOCTORAL FELLOWSHIP PROGRAM 1993-1994. The University of California offers postdoctoral fellowships to enhance the competitiveness of outstanding minority and women scholars for academic appointments at major research universities such as the University of California. Awards are for one academic year with the possibility of renewal for a second year pending demonstration of satisfactory progress. Stipends are $26,000 plus health benefits and up to $4,000 for research expenses. Applicants must be US citizens or permanent residents, and hold a PhD degree from an accredited university. Preference is given to minority and women candidates historically under-represented in their disciplines in higher education. Applications are encouraged from African Americans, American Indians, Asian Americans, Filipinos, Mexican Americans and Latinos, and from all women in Physical Sciences, Mathematics and Engineering. Further information and application material will be available in the fall. Application materials may be obtained from: President's Postdoctoral Fellowship Program, 300 Lakeside Drive, 18th Floor, Oakland, CA 94612-3500 (510) 987-9500. The application deadline is December 14, 1992.

ADVERTISEMENTS:

BOSTON COLLEGE - MATHEMATICS DEPARTMENT - One tenure-track assistant professorship to begin in September 1993. Candidates should have completed or nearly completed the Ph.D. and have strong potential and motivation in both research and undergraduate teaching. Teaching load will be five to six courses per year. Applicants should submit a statement of professional interests and goals, a curriculum vitae, and have at least three letters of recommendation sent which address the candidate's teaching and research . Send applications to: Bill Keane, Chair, Mathematics Dept., Boston College, Chestnut Hill, MA 02167. Email: keane@BC.edu For full consideration, completed applications should be received by December 31, 1992.

BRYN MAWR COLLEGE - MATHEMATICS AND COMPUTER SCIENCE DEPARTMENT - Applications are invited for positions in Mathematics and Computer Science, starting September, 1993. They should be sent to the appropriate committee, Department of Mathematics, Bryn Mawr College, Bryn Mawr, PA 19010. MATHEMATICS POSITIONS: One tenure track assistant professorship and one three-year renewable lectureship.Candidates must have completed a doctorate in a mathematical science by the starting date, and must show promise in research and a serious commitment to undergraduate and graduate teaching. All fields are acceptable, with a preference for applied mathematics or geometry. Please send a vita, research plan and three letters of recommendation to the Mathematics Search Committee. COMPUTER SCIENCE POSITIONS: Three-year renewable lectureship. Candidates should have completed a doctorate in computer science or a related field by the starting date,and must display a commitment to both teaching and scholarship, and an interest in curriculum development in a joint program with Haverford College. Please send a vita and three letters of recommendation to the Computer Science Search Committee. The college wishes particularly to encourage applications from individuals interested in joining a multicultural/international academic community. CLOSING DATE: January 1 1993 (late applications may be considered). Telephone: (215) 526-5348.Email:msearch@cc.brynmawr

CARLETON COLLEGE - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - Department of Mathematics and Computer Science has a tenure-track position beginning September, 1993. A Ph.D. in computer science or mathematics is required. The successful candidate will teach two courses per term, three terms per nine-month year, including upper-level computer science. Teaching excellence is the most essential consideration. Review of applications will begin in mid December and will continue until the position is filled. Send letter of application, resume, graduate transcript(s), and three letters of recommendation to Loren Haskins, Chair, Department of Mathematics and Computer Science, One North College Street, Northfield MN 55057-4025 (email:lhaskins@carleton.edu). At least one letter should specifically address teaching. Carleton College is a highly selective liberal arts college 35 miles south of Minneapolis, St. Paul. Department has twelve full-time members. Computing resources available

to department include NeXT's, MAC II's, PC's, DEC Microvax, RasterTech 3/85 workstation, transputer-equipped parallel processing stations and a central VAX cluster.

CLARKSON UNIVERSITY - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - The Department of Mathematics and Computer Science at Clarkson University invites applications for a tenure-track position in mathematics. Candidates must have: Ph.D. in mathematics or a closely related discipline; demonstrated excellence in research and in teaching; expertise in nonlinear waves or dynamical systems. Rank and salary are negotiable. Applications including vita and names of at least three references must be received by November 30, 1992. Starting date is January 1, 1993. Applications should be submitted to Professor A. Fokas, Department of Mathematics and Computer Science, Clarkson University, Potsdam, NY 13699-5815.

COLBY COLLEGE - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - Subject to final budgetary approval, we expect to have a tenure-track opening in pure mathematics at the assistant professor level, commencing September 1, 1993. Ph.D. required. The salary is competitive, and based on experience. Colby is a small, private, highly selective liberal arts collegelocated in central Maine. The student body numbers some 1700, the faculty 180. The Department of Mathematics and Computer Sciencescurrently numbers nine full-time and two part-time. All full-timefaculty have the Ph.D. We have major and minor programs in mathematicsand computer science. We are a young, active department, which places a high value on both teaching and research. The annual teaching load is 5 courses. The largest class size is 30. We have no preferences with regards to area of researchspecialization within pure mathematics. Candidates who are able to demonstrate excellence in teaching and are familiar with the use of computer algebra systems (in particular, Mathematica) in mathematicseducation are likely to be ranked higher in our selection process. An ability to teach some basic courses in computer science would also be desirable. Particularly well-qualified female applicants mybe eligible for appointment to one of the College's Claire Booth Luce Assistant Professorships for Women Scientists. Review of applications will begin January 20, 1993, and continue until the position is filled. Send a letter of application and a current curriculum vita to: Keith Devlin, Chair, Department of Mathematics and Computer Science, Colby College, Waterville, Maine 04901. Also, arrange for three letters of reference to be sent to the same address. These letters should deal with both your research and your teaching abilities.

COLORADO COLLEGE - DEPARTMENT OF MATHEMATICS - COLORADO SPRINGS, CO 80903 - Tenure track position in mathematics to begin August 29, 1993. Ph.D. expected. Assistant Professor is preferred but all ranks will be considered. All fields of specialization are welcome, but a background in analysis or applied math and an ability to teach undergraduatecomputer science is desirable. The Department of Mathematics values both excellence in teaching undergraduate mathematics and vigorous mathematical scholarship. Candidates should send a letter of application describing both your commitment to teaching and your mathematical interests, a curriculum vitae, a complete set of transcripts, and arrange to have sent three letters of recommendation (at least one addressing teaching) to Fred Tinsley at the above address. Applications received by January 1, 1993 are guaranteed full consideration.

COLUMBIA UNIVERSITY - BARNARD COLLEGE, DEPARTMENT OF MATHEMATICS, NEW YORK, NY 10027. One or more anticipated positions as Ritt Assistant Professor - for new Ph.D's regardless of age. One-year appointment, normally renewable for three more years. Teaching load, 2 courses per semester with possible graduate course in specialty. Please send vita, (p)reprints and have three letters of recommendation from professors familiar with your research and teaching sent to: Chair, Department of Mathematics, Columbia University, New York, NY 10027.

DARTMOUTH COLLEGE - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - Tenure-track Assistant Professor in Differential Geometry, initial appointment in 1993-94 academic year. Teaching four 10-week courses over 2 or 3 terms. First priority is to appoint a differential geometer, second priority is in algebra. Exceptional circumstances could lead to an appointment in some third field. Send letter of application, vita, research interests, four letters of recommendation, at least one on teaching,

to Phyllis Bellmore, Mathematics and Computer Science, 6188 Bradley Hall, Dartmouth College, Hanover, NH 03755-3551. Applications complete by Feb. 1 considered first.

DARTMOUTH COLLEGE - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - John Wesley Young Research Instructorship, 2-yrs., new or recent Ph.D.'s whose research overlaps department. members'.Teach 4 ten-week courses spread out over 2 or 3 quarters. $34,000 for nine months; $7,556 summer research stipend. Send application letter, resume, research/thesis description, graduate transcript, and 3 (prefer 4) references (1 discussing teaching) to Phyllis A. Bellmore, Mathematics and Computer Science, Dartmouth College, 6188 Bradley Hall, Hanover, NH, 03755-3551. Files complete Jan. 15 considered first.

DUKE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Applications are invited for two tenure/tenure track positions in Mathematics: all fields, rank and salary open, starting September 1,1993. Applicants should send a curriculum vitae, a research plan, and a completed information form (available from the Department by email at apply@math.duke.edu) and they should arrange for three letters of recommendation to be sent. A teaching recommendation is also strongly suggested. Complete applications received by January 15, 1993 will be guaranteed full consideration. Address correspondence to: Faculty Search Committee, Department of Mathematics, Duke University, Box 90321, Durham, NC 27708-0321.

EMORY UNIVERSITY - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - The Department of Mathematics and Computer Science, Emory University, invites applications for two anticipated tenure track Assistant Professorships for 1993-94. Applicants must have a Ph.D. in Mathematics, with a promising research program centered in Algebra or Topology. As the department offers several undergraduate programs within Emory College, and the Ph.D. in Mathematics, applicants are expected to have strong records, or promise, as undergraduate and graduate teachers. Applicants should send their CV's (including at least three recommenders' names) and see that recommendation letters are sent to: Professor Dwight Duffus, Screening Committee, Department of Mathematics and Computer Science, Emory University, Atlanta GA 30322.Screening of applications will begin on 1 January 1993.

GEORGETOWN UNIVERSITY - DEPARTMENT OF MATHEMATICS - The Department of Mathematics anticipates a tenure-track position at the Assistant Professor level beginning August 25, 1993. The Ph.D. degree in Mathematics is required with research credentials in partial differential equations, mathematical control theory or harmonic analysis. Strong interest in undergraduate teaching, preferably with some experience is desired. Send resume and reprints or preprints of no more than three research papers and arrange for three letters of reference to be sent to Professor John Lagnese, Chair, Search Committee, Department of Mathematics, Georgetown University, Washington D.C. 20057-0996. Complete applications must be received by February 1, 1993.

GETTYSBURG COLLEGE - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - Gettysburg College invites applications for a tenure-track assistant-professor position in mathematics beginning September 1993. A Ph.D in mathematics, promise of excellence in teaching, and a commitment to continued scholarship are essential. Gettysburg College is a highly selective liberal-arts college of about 2000 students in a beautiful and historic area of south-central Pennsylvania. It is conveniently located within an hour and a half drive of the Washington-Baltimore area. Send letter of application stating teaching and scholarship interests and goals, curriculum vitae,and the names of three references (at least one who can address teaching effectiveness) to: James P. Fink, Chair, Department of Mathematics and Computer Science, Gettysburg College, Gettysburg, PA 17325. Formal evaluation of applications will begin on January 20, 1993 and continue until the position is filled.

HARVEY MUDD COLLEGE - DEPARTMENT OF MATHEMATICS - The Mathematics Department of Harvey Mudd college solicits applicants for a tenure-track Assistant Professorship in an area bridging mathematics and computer science. A strong commitment to, and promise of, excellence in teaching are essential. Applicants should be active in a research area such as Parallel or Combinatorial Algorithms,

Numerical Analysis and Algorithms, Automated Reasoning, or Computational Geometry. Applicants must be ablet o teach broadly within mathematics and the mathematical aspects of computer science and to work well with others in developing departmental programs. Harvey Mudd College is a highly selective undergraduate institution. Our students major in mathematics, computer science, biology, chemistry, engineering, or physics. A one-year course in calculus is a prerequisite for admission to the college. Ph.D. degrees have been earned by 40.7% of the college's pre-1980 graduates, thehighest percentage in the nation. The college has an enrollment of 630 and is associated with four other undergraduate colleges and a graduate school in Claremont, forming an academic community of about 5,000students. The College has twelve mathematics faculty and the Claremont Colleges combined have a total of 48 Mathematics and Computer Science faculty. An excellent network of modern computer workstations is available. Preference will be given to applications received by January 10, 1993. Applicants should send a curriculum vitae, a description of their research, and arrange to have three letters of reference sent directly to the Search Committee, Department of Mathematics, Harvey Mudd College, Claremont, CA 91711.

IOWA STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Subject to budgetary approval, there will be two tenure-track positions starting in August 1993. The positions will be full time during the 9-month academic year; they require a Ph.D., or equivalent. One position will be in numerical analysis, and will be at the assistant professor or associate professor level. The successful candidate should have a strong interest in teaching at both the graduate and undergraduate level. He or she should maintain an active research program in some branch of numerical analysis. The candidate will be expected to apply for externally funded grants. Senior candidates should have a strong record of publications and grants. Start-up funds for a workstation will be available. The salary will be commensurate with qualifications. The second position will be in mathematics education, at the assistant professor level.Candidates should have strong interest and qualifications in teaching both mathematics and mathematics education, the latter at both the graduate and undergraduate level. They should maintain an active research program in mathematics education. The duties will include teaching, advising, supervision of student teachers, and participation in regional and national math ed activities. The department will begin screening applications January 15, 1993; applications will be accepted, however, until the positions are filled. Applications (vita,description of research plan, and three letters of recommendation) should be sent to Stephen J.. Willson, Chair, Department of Mathematics, Iowa State University, Ames, Iowa 50011.

JOHNS HOPKINS UNIVERSITY - DEPARTMENT OF MATHEMATICS - Applications are invited for anticipated faculty positions (beginning Fall 1993) within the general areas of algebra, analysis, geometry, number theory and topology. Of particular interest is the area of algebraic number theory, and one position may be filled at the senior level. Applicants should submit a curriculum vitae and arrange for letters of recommendation to be sent to: Appointments Committee, Dept. of Mathematics, 404 Krieger Hall, Johns Hopkins Univ., Baltimore, MD 21218.(Applications in probability,statistics, operationg research, and numerical methods will not be considered; applicants in these areas should instead contact the Dept. of Mathematical Sciences in the School of Engineering.).

JOHNS HOPKINS UNIVERSITY - DEPARTMENT OF MATHEMATICAL SCIENCES -Applications are invited for 3 anticipated faculty positions within the areas of Numerical Linear Algebra (Senior applicants preferred), Statistics, Operations Research, Applied Discrete Mathematics. Selection is based on demonstration and promise of excellence in research, teaching, and innovative applications. Applicants are asked to furnish a curriculum vitae, transcripts (junior applicants only), reprints (if available), a letter describing professional interests and aspirations, and to arrange for three letters of recommendation to:Prof. John C. Wierman, Chair, Department of Mathematical Sciences, 220 Maryland Hall, The Johns Hopkins University, Baltimore, Maryland 21218-2689. Applications are requested by January 15, 1993. Applicants whose primary research is in algebra, analysis, geometry, logic, number theory, or topology will not be considered.

KANSAS STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Subject to budgetary approval, applications are invited for several tenure track and visiting positions commencing August 18, 1993; rank and salary commensurate with qualifications. All fields will be considered, but for some of the

tenure-track positions, preference will be given to candidates in Differential Equations, Geometry/Topology, Algebra, and Functional Analysis. Applicants must have strong regearch credentials and a commitment to excellence in teaching. A Ph.D. in mathematics or a Ph.D. dissertation accepted with only formalities to be completed is required. Letter of application, current vita, description of research and three letters of recommendation should be sent to Louis Pigno, Department of Mathematics, Cardwell Hall 137, Kansas State University, Manhattan, KS 66506. It is expected that offers will begin on December 15, 1992, but applications for all positions will be accepted until February 1, 1993, or until positions are closed.

KENNESAW STATE COLLEGE - DEPARTMENT OF MATHEMATICS - invites applications for at least one tenure-track position at the rank ofAssistant Professor. Kennesaw State College is a comprehensive and progressive regional college recently recognized as up and coming in *US News And World Report*. Located in an attractive suburban area in Metropolitan Atlanta, the college is one of the fastest growing in the University System of Georgia, enrolling over 11,000 graduate and undergraduate students this fall. Qualifications are a Ph.D. in Mathematics, Statistics, or Mathematics Education with a strong graduate mathematics component required; strong commitment to undergraduate education as well as an interest in scholarly activities. Salary commensurate with experience and qualifications. Position(s) available September, 1993. Candidates should send a detailed resume,and arrange for at least three letters of recommendation, and graduate transcript to be sent to : Dr. Lewis VanBrackle, Chair, Search Committee, Departmentof Mathematics, Kennesaw State College, P.O. Box 444, Marietta, GA 30061. All applications received by March 1, 1993 will be considered. However,applications will be accepted until position is filled.

LAKE FOREST COLLEGE - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE LAKE FOREST, ILLINOIS 60045-2399 Applications are invited for a continuing appointment in Mathematics at the Assistant Professor level,starting in the Fall of 1993. Future tenure consideration is possible. We seek candidates with a Ph.D., a commitment to excellent teaching in a quality liberal arts environment, and an active interest in mathematical research. The teaching load is three courses per semester. Applicants should send a Curriculum Vitae and arrange to have three letters of reference and a graduate transcript sent by December 20, 1992, to Edward W. Packel, Chairperson.

LOYOLA UNIVERSITY OF CHICAGO - DEPARTMENT OF MATHEMATICAL SCIENCES - The Department of Mathematical Sciences anticipates at least one tenure track position in August, 1993. Requirements are a Ph.D. in Computer Science or a closely related field, excellent research potential, and a commitment to quality teaching. Successful candidates are expected topursue an active research program. The department offers courses in mathematics, computer science, and statistics at the undergraduate level and a M.S. degree in computer science. The department has 29 full-time faculty, over 200 undergraduate majors, and over 100 graduate students.Interviews will begin in January and continue until all positions are filled. Send detailed C.V. and at least three letters of recommendation to CS Hiring Committee, Department of Mathematical Sciences, Loyola University, Chicago, IL 60626.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY - DEPARTMENT OF MATHEMATICS - The Department of Mathematics may make several appointments at the assistant professor level in pure mathematics for the year 1993-1994. 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 mathematicians with doctorates who show definite promise in research. Applicants please send (a) a vitae; (b) a description of the research in your theses; and (c) the research which you plan for next year to: Pure Mathematics Committee, Massachusetts Institute of Technology, Room 2-263, Cambridge, MA 02139-4307.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY - DEPARTMENT OF MATHEMATICS - One or two assistant professorships in applied mathematics will probably become available in fall 1993 for persons typically about two years beyond their doctorates. This time we are looking especially, though not exclusively, for unusual new talent in the areas of numerical analysis and/or statistics. For further

information, write to:Committee on Applied Mathematics, Room 2-345, Department of Mathematics, Massachusetts Institute of Technology, Cambridge, MA 02139-4307.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY - DEPARTMENT OF MATHEMATICS - C. L. E. MOORE INSTRUCTORSHIPS IN MATHEMATICS - Open to mathematicians with doctorates who show definite promise in research. Teaching loads are six hours per week during one semester, and three hours per week during the other, in order that theappointees may have ample time for research. Please send (a) a vita;(b) a description of the research in your theses; and (c) the research which you plan for next year to: Pure Mathematics Committee,Massachusetts Institute of Technology, Room 2-263, Cambridge, MA 02139-4307.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY - DEPARTMENT OF MATHEMATICS - A limited number of instructorships in applied mathematics are available for recent Ph.D.'s. Appointments will be made mainly on the basis of superior research potential. Applications should be completed by February 15 and our decisions will be announced in the early spring. For further information, write to: Committee on Applied Mathematics,Room 2-345, Department of Mathematics, Massachusetts Institute of Technology, Cambridge, MA 02139-4307.

MICHIGAN STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - The Department is seeking applicants for several tenure track positions: openings are available at each of the Assistant, Associate, and Full Professor levels. Preferred areas are: "Partial Differential Equations","Algebraic Geometry", and "Lie Groups, Algebras, and Representations". Strong candidates in other areas will also be seriously considered. Excellence in research and teaching is essential, and two or more years of experience beyond the Ph.D. will generally be expected. Please send a resume and arrange to have three letters of recommendation sent to HIRING COMMITTEE, Department of Mathematics, Michigan State University, East Lansing, MI 48824-1027: e-mail 21144hiring@msu.edu. It would be helpful if resume included (if possible) an electronic address. Applications received by Dec. 1, 1992 will be given more attention.

MICHIGAN STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - EAST LANSING, MI 48824-1027, Professor Richard E. Phillips, Chairperson. One or more Postdoctoral fellowships in Mathematics. The appointment is for two years. Duties include teaching three (3 credit) semester courses each year with the expectation that the fellow will devote remaining time to research. These fellowships are normally offered to persons (regardlessof age) who have had their doctorate less than two years. There will be some instructor positions available also. Please send a resume, a brief statement of research interests and arrange to have three letters of recommendation sent to: THE HIRING COMMITTEE, Department of Mathematics, Michigan State University, East Lansing, MI 48824-1027:e-mail 21144HIRING@MSU.EDU. Application deadline, December 1, 1992.

MICHIGAN TECHNOLOGICAL UNIVERSITY - DEPARTMENT OF MATHEMATICAL SCIENCES - HOUGHTON, MI 49931 - Applications are invited for four tenure-track positions as well as visiting and temporary positions starting August 1993. Subject to funding, the department anticipates tenure track openings in the areas of algebra (1 position), applied mathematics (2 positions), and mathematics education (1 position). Candidates for the positions in algebra and applied mathematics must have a Ph.D. in mathematics while candidates in mathematics education are expected to have a Ph.D. or Ed.D. degree and be able to teach undergraduate mathematics courses. The successful candidates are expected to have strong teaching credentials and outstanding research potential. Appointment at the senior level will require a strong research record. Duties include teaching, service and research with a normal teaching load of courses (6 to 8 hours) per quarter. Preference will be given to candidates who can complement existing research interests in the department. Send curriculum vitae, transcript and three letters of recommendation to: Alphonse Baartmans, Head, Department of Mathematical Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295. Review of applications will begin on December 1, 1992. Applications will be accepted until the positions are filled.

NEW MEXICO STATE UNIVERSITY, DEPARTMENT OF MATHEMATICAL SCIENCES, LAS CRUCES, NM 88003 - The department invites applications for possible visiting and tenure track positions in pure and applied mathematics and statistics for academic year 1993-1994. New tenure track positions will be primarily at the assistant professor level, but appointments at a higher rank may be possible. Strong commitment to both research and teaching required. The department has 32 tenure track faculty members and offers B.S., M.S., and Ph.D. degrees. Applications are kept on file through hiring period and positions filled as openings occur. Arrange for vita, short research description and at least three reference letters to be sent to: Hiring Committee, Department of Mathematical Sciences, New Mexico State university, Las Cruces, NM 88003.

OHIO NORTHERN UNIVERSITY- DEPARTMENT OF MATHEMAICS AND COMPUTER SCIENCE ADA, OH 45810 - The Department of Mathematics and Computer Science invites applications for a tenure-track position in Statistics. A Ph.D. in Statistics or a Ph.D. i n Mathematics with a M.S. in Statistics is required. ONU is a private, selective, undergraduate United Methodist University, with colleges of Arts and Sciences, Engineering, Business, Pharmacy and Law. Send letter, resume, and three letters of reference to: Robert Hovis, Chair, by February 1, 1992. Applications will be considered until the position is filled.

THE OHIO STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - The Department of Mathematics of the Ohio State University hopes to have available several positions, both visiting and permanent, effective Autumn quarter, 1993. Candidates in all areas of applied and pure mathematics, including those with demonstrated interest in pedagogical matters, are invited to apply. Significant mathematical research accomplishments or exceptional promise and evidence of good teaching ability, will be expected of successful applicants. Please send credentials and have letters of recommendation sent to Professor Dijen Ray-Chaudhuri, Department of Mathematics, The Ohio State University, 231 W. 18th Avenue, Columbus, Ohio 43210. Review of resumes will begin immediately.

POTSDAM COLLEGE - SUNY - DEPARTMENT OF MATHEMATICS - ASSISTANT PROFESSOR - Potsdam College of the State University of New York invites applications for an anticipated tenure-track position in Mathematics, at the rank of Assistant Professor, commencing September 1, 1993. The normal teaching load is 12 hours of undergraduate and beginning graduate level mathematics courses per semester. Applicants must have a Ph.D. in Mathematics (or be near completion). The successful candidate must, in addition, show evidenceof being (or having the potential to become) an excellent teacher. The salary will be competitive. Send letter of application, resume, graduate transcripts (copies are acceptable) and three letters of reference to: Dr. J. Parks, Search Committee Chair, Department of Mathematics, Potsdam College, Potsdam, NY 13676. Review of applications will commence February 1, 1993 and continue until the position is filled.

PURDUE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Several tenure-track or two-year research assistant professorships beginning August 1993. PhD by September 1993, exceptional research promise, and excellence in teaching required. Possible positions at the Associate Professor/Professor level beginning August 1993. PhD and excellent research credentials required. All applicants must mention at least one Purdue faculty member with whom they expect to have common research interests. Send resume and three letters of recommendation (one addressing teaching for assistant professorships) by January 8, 1993 to:Leonard Lipshitz, Head, Department of Mathematics, Purdue University, West Lafayette, IN 47907-1395.

RICE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Applications are invited for a tenure-track assistant professorship. There is a possibility of an upgrade to associate or full professorship for an exceptional senior candidate. Candidates must have an extremely strong research background and good teaching skills. Preference will be given to applicants in algebraic geometry, geometric analysis, and geometric topology. Duties will include research and classroom teaching. Please send a curriculum vitae and at least three letters of recommendation to: Appointments Committee, Department of Mathematics,

Rice University, PO Box 1892,Houston, TX 77251. Applications received by December 31, 1992 will be assured full consideration.

RICE UNIVERSITY - DEPARTMENT OF MATHEMATICS - GRIFFITH CONRAD EVANS INSTRUCTORSHIPS - Postdoctoral appointments for two to three years for promising research mathematicians with research interests in common with the active research areas at Rice, particularly geometric topology, geometric analysis, differential geometry, mathematical physics and ergodic theory. Duties will include research and classroom teaching. Applications received by December 31, 1992 will receive full consideration. Inquiries and applications should be addressed to Chair, Evans Committee, Department of Mathematics, Rice University, PO Box1892, Houston, TX 77251-1892.

RUTGERS UNIVERSITY - ACADEMIC FOUNDATIONS DEPARTMENT - ASSISTANT OR ASSOCIATE PROFESSOR AND COORDINATOR OF DEVELOPMENTAL MATHEMATICS - The Academic Foundations Department of Rutgers University in Newark, an interdisciplinary department providing courses, academic mentors, and tutors for underprepared, nontraditiona lstudents, is recruiting for a tenure-track Assistant or Associate Professor to teach in and coordinate the developmental mathematics unitof the Department. Doctorate required. Preference given to those who have demonstrated excellence in teaching and have a record of research and publication. Responsibilities include teaching computation, algebra, pre-calculus and calculus, developing curricula, training tutors, advising, serving on committees, and supervising a small teaching staff. Teaching assignments may include both day and evening classes. Review of applicants begins November 2, 1992 and will continue until position is filled. The initial appointment is for three years on a twelve-month contract, starting July 1, 1993. Salary is competitive, based on rank and experience. Arrange to have sent 3 confidential letters of evaluation and send a vita and a letter of application, indicating pedagogical philosophy and relating teaching and research experience to the position, to: Arthur B. Powell, Chair, Academic Foundations Department, Rutgers University, Newark, NJ 07102. Hiring is subject to final budgetary approval.

SOUTHERN ILLINOIS UNIVERSITY AT CARBONDALE - DEPARTMENT OF MATHEMATICS-NUMERICAL ANALYSIS POSITION - Applications are invited from qualified candidates for a tenure-track position at the assistant professor level beginning on August 16, 1993. Ph.D. in mathematics with specialization in numerical analysis required. Candidates must have demonstrated excellence in research or potential for such. Evidence of teaching effectiveness is required (foreign applicants must provide evidence of ability to teach in English effectively). Send letter of application, resume, and three letters of recommendation to: Numerical Analysis c/oRonald B. Kirk, Chair, Department of Mathematics, Southern Illinois University at Carbondale, Carbondale, Illinois, 62901. The closing date for applications is December 10, 1992 or until position is filled.

SOUTHERN ILLINOIS UNIVERSITY AT CARBONDALE - DEPARTMENT OF MATHEMATICS -STATISTICS POSITION - Applications are invited from qualified candidates for a tenure-track position at the assistant professor level beginning on August 16, 1993. Ph.D. in statistics or in mathematics with a concentration in statistics is required. Preference is for mathematical statistics and statistical inference with interest in applications. Candidates must have demonstrated excellence in research or potiential for such. Evidence of teaching effectiveness is required (foreign applicants must provide evidence of ability to teach in English effectively). Send letter of application, resume, and three letters of recommendation to: Statistics c/o Ronald B. Kirk, Chair, Department of Mathematics, Southern Illinois University at Carbondale, Carbondale Illinois, 62901. The closing date for applications is December 10, 1992 or until position is filled.

TENNESSEE TECHNOLOGICAL UNIVERSITY - DEPARTMENT OF MATHEMATICS - COOKEVILLE, TN 38505 Two tenure-track positions at the rank of Assistant Professor to begin August 1993. Ph.D. in Mathematical Sciences, evidence of excellent teaching ability/potential and strong promise in research are required. An analyst is preferred for one position. Duties include teaching graduate and undergraduate courses, directing master's students, engaging in research activities and participating in course development. Initial review of applications will begin 15 January, 1993; applications will be

accepted until the positions are filled. Transcripts, a curriculum vitae and three lettersof recommendation should be sent to: Dr. J.T.B. Beard, Jr., Chairman, Search Committee. TTU will hire only U.S. citizens and aliens lawfully authorized to work in the U.S.

TEXAS TECH UNIVERSITY -DEPARTMENT OF MATHEMATICS - The Department of Mathematics at Texas Tech University anticipates openings for at least one tenure track Assistant Professorship beginning in the fall semester of 1993. To qualify the applicants must: 1. have a PhD from a recognized university; 2. have a strong dedication to both teaching and research; 3. exhibit research interests that are compatible with ongoing programs in the department; 4. be willing and able to work with students at both the undergraduateand graduate level. To apply, please send a resume and have three letters of recommendation sent to Harold Bennett, Chairman of Hiring Committee, Department of Mathematics, Texas Tech University, P. O. Box 41042, Lubbock, TX 79409.

UNION COLLEGE - MATHEMATICS DEPARTMENT -SCHENECTADY, NY 12308 - A possible Visiting Assistant Professorship starting September, 1993. All fields considered. Excellence in teaching and strong research potential required (Institutional expectations and support are quite balanced between teaching and research.) Experience with computer applications to mathematics is desired but not necessary. Union's academic computing facilities include a cluster of 4 VAX's, student Mac and PC rooms, and graphics labs; every math faculty office has a Mac SE/30, II, or IIci ,each equipped with Mathematica. The teaching load is 5 courses per year typically split 2-2-1 over our three 10 week terms. Send vita and three letters of reference - at least one of which discusses teachingqualifications - to Search Committee Chair at:Union College Mathematics Department, Schenectady, New York, 12308.

UNIVERSITY OF ARIZONA -DEPARTMENT OF MATHEMATICS - TUSCON, AZ 85721. The Mathematics Department at the University of Arizona will have tenure-track and postdoctoral positions available beginning Fall,1993. Tenure track positions: Excellent research record or potential, strong commitment to teaching required. Fields should complement but not duplicate existing department research strengths in arithmetic geometry, computational science, dynamical systems, differential geometry, nonlinear science and number theory. Postdoctoral Fellowships (Research Associates): Applicants with strengths in all areas compatible with department interests are encouraged to respond. In addition, special Center of Excellence Awards in nonlinear optics and fluid mechanics are available. The Mathematics Department may also have several visiting positions for next year. We encourage early application. Deadline will be December 15, 1992 or whenever positions are filled. Send application, which should include a letter of interest, curriculum vitae with a list of publications, and a minimum of three (3) letters of recommendation (enclosed or arrange to be sent),to: Personnel Committee, Department of Mathematics, University of Arizona, Tucson, Arizona 85721

UNIVERSITY OF CALIFORNIA - BERKELEY -DEPARTMENT OF MATHEMATICS - CHARLES B. MORREY JR. ASSISTANT PROFESSORSHIPS -- We invite applications for these special two-year nontenure-track) positions effective July 1, 1993. Applications should have a recent Ph.D. in the areas of algebra, analysis, applied mathematics, foundations, or geometry and topology. Applicants should send a resume, reprints, preprints, and/or dissertations abstract, and ask three people to send letters of recommendation to the Vice Chair for Faculty Affairs at Charles B. Morrey Jr. Assistant Professorships Department of Mathematics, University of California at Berkeley, Berkeley, CA 94720. We should receive this material no later than January 15, 1993. Applications submitted after the deadline will not be considered.

UNIVERSITY OF CALIFORNIA - BERKELEY - FELLOWSHIPS IN MATHEMATICS AND MOLECULAR BIOLOGY. The Program in Mathematics and Molecular Biology has graduate and postdoctoral fellowship support available. Current topics in the Program include geometry, topology, and sequence analysis of DNA,molecular dynamics, and mapping functions and algorithms for DNA and protein structure prediction. Other areas will be considered. Fellowships can be held at any university or college in the United States. Awards made assuming continuation of funding. Deadline For Applications:

March 1, 1993. Apply to:PMMB, 103 Donner Lab, University of California, Berkeley CA 94720. E-mail: sylviaj@violet.berkeley.edu.

UNIVERSITY OF CALIFORNIA - BERKELEY - DEPARTMENT OF MATHEMATICS - TEMPORARY POSTDOCTORAL POSITIONS -- Several temporary positions beginning in Fall 1993 are anticipated for new and recent Ph.D.'s of any age, in the areas of algebra, analysis,and applied mathematics, foundations or geometry and topology. The terms of these appointments may range from one to three years. Applicants for NSF or other postdoctoral fellowships are encouraged to apply for these positions; combined teaching/research appointments may be made for up to three years. Mathematicians whose research interests are close to those of regular department members will be given some preference. Applicants should send a resume, and reprints, preprints,and/or dissertation abstract, and ask three people to send letters of recommendation to The Vice Chair for Faculty Affairs at Temporary Postdoctoral Positions, Department of Mathematics, University of California at Berkeley, Berkeley, CA 94720. We should receive this material no later than January 15, 1993. Applications submitted after the deadline will not be considered.

UNIVERSITY OF CALIFORNIA - BERKELEY - DEPARTMENT OF MATHEMATICS - TENURED POSITION - We inviteapplications for one or more positions effective July 1, 1993, at tenure level (Associate or Full Professor) subject to budgetary approval, in the areas of algebrta, analysis, applied mathematics, foundations, or geometry and topology. Demonstrated leadership in research is expected of applicants. Applicants should send a curriculum vitae, list o fpublications, a few selected reprints or preprints, and the names and addresses of three references to The Vice Chair for Faculty Affairs at Tenured Position, Department of Mathematics, University of California at Berkeley, Berkeley, CA 94720. We should receive this material no later than January 15, 1993. Applications received after the deadline will not be considered.

UNIVERSITY OF CALIFORNIA - BERKELEY - DEPARTMENT OF MATHEMATICS - ASSISTANT PROFESSORSHIPS - We invite applications for one or more positions effective July 1, 1993, at the tenure-track Assistant Professor level, subject to budgetaryapproval, in the areas of algebra, analysis, applied mathematics, foundations, or geometry and topology. Applicants are expected to have demonstrated outstanding research potential, normally including major contributions beyond the doctoral dissertation. Applicants should send a resume, and reprint or preprints, and/or dissertation abstract, and ask three people to send letters of recommendation to The Vice Chair for Faculty Affairs at Assistant Professorships, Department of Mathematics, University of California at Berkeley, Berkeley, CA 94720. We should receive this material no later than January 15, 1993. Applications received after the deadline will not be considered.

UNIVERSITY OF CALIFORNIA - DAVIS - DEPARTMENT OF MATHEMATICS - Applications are invited for several research assistant professorships in mathematics at the University of California, Davis, effective July 1, 1993. Appointments will be made at a salary commensurate with qualifications. These appointments are for one year and renewable up to two times. Qualifications include a PhD.and an outstanding record or great promise in teaching and research. Duties include undergraduate and graduate teaching and mathematical research. The teaching load is five quarter courses per year, and may include one advanced course in the candidate's field. The postmarked deadline for applications is February 19, 1993. An application consists of a curriculum vitae, list of publications, and at least three letters of reference sent to: Chair of Search Committee, Department of Mathematics, University of California, Davis, California, 95616-8633.

UNIVERSITY OF CALIFORNIA, LOS ANGELES - DEPARTMENT OF MATHEMATICS - REGULAR POSITIONS IN PURE AND APPLIED MATHEMATICS - Subject to availability of resources and administrative approval, one regular position in pure and applied mathematics. The six specific search areas are as follows: 1)statistics; 2) applied and computational mathematics; 3) logic and mathematical computer science; 4) geometry and topology (including dynamical systems and geometric partial differential equations); 5)analysis and differential equations (including mathematical physics);

6)algebra, number theory and combinatorics (including algebraic geometryand representations). Very strong promise in research and teaching required. Positions initially budgeted at the assistant professor level. Sufficiently outstanding candidates at higher levels will also be considered. Teaching load: average 1.5 courses per quarter, or 4.5 quarter courses per year. Toapply, send electronic mail to search@math.ucla.edu OR write to Thomas M. Liggett, Chair, Department of Mathematics, University of California, Los Angeles, CA 90024-1555.Attn: Staff Search.

UNIVERSITY OF CALIFORNIA - LOS ANGELES -DEPARTMENT OF MATHEMATICS - TEMPORARY POSITIONS - Subject to availability of resources and administrative approval: 1) Two E. R. Hedrick Assistant Professorships. Applicants must show very strong promise in research and teaching. Salary $39,600. Three year appointment. Teaching load: four quarter courses per year, which may include one advanced course in the candidate's field.v Preference will be given to applications completed by January 1, 1993; 2) Several Research Assistant Professorships in Computational and Applied Mathematics. Applicants must show very strong promise in research and teaching. Salary $39,600. One year appointment, probably renewable up to two times. Teaching load: at most four quarter courses per year, which may include one advanced course in the candidate's field. Preference will be given to applications completed by January 1, 1993; 3) One or two Adjunct Assistant Professorships in the Program in Computing (PIC).Applicants must show very strong promise in teaching and research, preferably in an area related to computing. Teaching load: four quarter programming courses and an advanced quarter course of the candidate's choice per year. One year appintment, probably renewable once. Salary range $39,600 - $47,000. Preference will be given to applicationg completed by February 1, 1993; 4) A Lectureship in the Program in Computing (PIC). Applicants must show very strong promise in the teaching of programming. M.S. in Computer Science or equivalent degree preferred. Teaching load: six quarter programming courses per year. One-year appointment, probably renewable one or more times, depending on the needs of the program. Salary is based on experience and begins at $34,248. Preference will be given to applications completed by February 1, 1993; 5) A few Adjunct Assistant Professorships. One year appointments, probably renewable once. Strong research and teaching background required. Salary $35,9000 - $40,500. Teaching load: five quarter courses per year; 6) Several positions for visitors. To apply, send electronic mail to search@math.ucla.edu OR write to Thomas M.Liggett, Chair, Department of Mathmatics, University of California, LosAngeles, CA 90024-1555. Attn: Staff Search.

UNIVERSITY OF CINCINNATI, DEPARTMENT OF MATHEMATICAL SCIENCES - CHARLES PHELPS TAFT POSTDOCTORAL FELLOWSHIPS - Applications are invited. The award carries an annual stipend of $25,000, plus moving expenses up to $500, and a research allowance of $1,000. Health insurance, single coverage, is included. Deadline is February 1. Additional information may be obtained from Taft Postdoctoral Fellowships, University of Cincinnati, ML 627, Cincinnati, OH 45221-0627.

UNIVERSITY OF DELAWARE - The Department of Mathematical Sciences will have a tenure-track assistant professor position in discrete mathematics beginning September 1993. Preference given to applicants whose research is compatible with current faculty (designs, finite geometry, extremal graph theory). Applicability of research area (e.g., coding theory, cryptography) and use of computing in teaching/research are desirable.Will be expected to teach some courses in Abstract Algebra. Send vitae and three letters of recommendation by January 31, 1993 to Dr. Gary Ebert, Chair Search Committee, Department of Mathematical Sciences, University of Delaware, Newark, DE 19716.

UNIVERSITY OF FLORIDA - The Department of Mathematics invites applications for three tenured or tenure-track appointments in mathematics, effective August 1993. In the case of junior candidates, preference will be given to applicants with post-doctoral experience who have made substantial research contributions beyond the doctoral dissertation. Senior candidates are expected to have demonstrated leadership in research. All applicants should forward a curriculum vitae, a list of publications, and a small number of reprints and/or preprints to Chair of Search Committee, Department of Mathematics,University of Florida, Gainesville, FL 32611-2082. Candidates should supply evidence of commitment to teaching and arrange for at least three letters of recommendation to be forwarded. Full consideration will be given to candidates whose materials arrive by December 31, 1992.

UNIVERSITY OF HAWAII - DEPARTMENT OF MATHEMATICS - One or more tenure-track/visiting professorships possible for fall 1993, pending clearance and availability of funds.The ranks for these positions are open. Minimum qualifications include a Ph.D. in mathematics, a commitment to research and teaching, and achievement appropriate to rank. Preference will be given to those applicants whose specialties blend well with those already represented in the department. Applicants should send a detailed resume, and have 3 confidential letters of recommendation sent to R.R. Colby, Chairman, Department of Mathematics, University of Hawaii, Honolulu, HI 96822.Applications and letters of reference must be postmarked by 12/24/92 to be guaranteed full consideration.

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN - DEPARTMENT OF MATHEMATICS
Applications are invited for the following positions commencing August,1993: 1) one or more assistant professor tenure-track faculty positions.2) one rank open faculty position. We are particularly interested in hiring in the areas of applied mathematics, combinatorics, optimization, partial differential equations, and probability. Outstanding candidates in all fields of mathematicg are encouraged to apply and will be seriously considered. Some visiting appointments for the 1993-1994 academic year are also anticipated. Salary and teaching load are competitive. Candidates must have completed the PhD by the time the appointment begins. Candidates should send a letter of application, curriculum vitae and publication list, and arrange to have three letters of reference sent directly to Gerald J. Janusz, Chair, Department of Mathematics, University of Illinois at Urbana-Champaign, 1409 W. Green St. Urbana, Illinois 61801. Tel (217)333-3352. e-mail:search@symcom.math.uiuc.edu. In order to ensure full consideration, all application materials including letters of reference should be received by December 7, 1992. Interviews may be conducted prior to December 7, but all completed applications received by that date will receive full consideration. Candidates are expected to present evidence of excellence, or potential for excellence, in research and teaching.

UNIVERSITY OF IOWA - DEPARTMENT OF MATHEMATICS - The Mathematics Department of the University of Iowa invites applications for the following positions:1. Two tenure-track appointments at the Assistant or Beginning Associate Professor level, starting in August 1993. One position is for a specialist in some aspect of harmonic analysis/representation theory,probability theory/stochastic analysis, or topology of manifolds/dynamical sygtems. The other position is for a specialist in some aspect of differential equations (including representation theory, mathematical physics, and quantum groups), differential geometry, algebraic geometry, or topology of manifolds. Selection will be based on evidence of outstanding research accomplishments or potential, and teaching ability. A Ph.D. or equivalent training is required. 2. Pending availability of funds, one or more visiting positions for all or part of the 1993-94 academic year. Selection will be based on research expertise and teaching ability. Preference will be given to applicants whose scholarly activity is of particular interest to members of the current faculty. The University of Iowa welcomes the employment of professional couples on its faculty and staff, permits the appointment of faculty couples within the same department, and permits the sharing of a single appointment by a faculty couple. Formal screening will begin January 4, 1993. To apply, send a complete vita and have three letters of recommendation sent to: Professor Richard Randell, Chair, Department of Mathematics, University of Iowa, Iowa City, Iowa 52242.

UNIVERSITY OF KANSAS - DEPARTMENT OF MATHEMATICS - Applications are invited for a tenure-track position at the assistant professor level and for a visiting position at the assistant professor level (pending funding) beginning August 17, 1993, or as negotiated. For the tenure-track position, preference will be given to candidates first in statistics, then computational mathematics (e.g., in numerical analysis, PDE, or dynamical systems), then to candidates whose specialties mesh well with those already represented in the department, then to all other areas of mathematics. For the visiting position, preference will be given to candidates whose research interests mesh well with those of our faculty. Candidates must have a Ph.D. or its requirements completed by August 15, 1993. Postdoctoral experience for tenure-track position is preferred but optional. Application, detailed resume with description of research, and three recommendation letters should be sent to C.J.Himmelberg, Chairman, Department of Mathematics, 405 Snow Hall, University of Kansas, Lawrence, KS 66045-2142. Deadlines: Review ofapplications will begin on December 1, 1992 and will continue until the positions are filled.

UNIVERSITY OF LOUISVILLE, DEPARTMENT OF MATHEMATICS - The Department of Mathematics is seeking applications for an entry-level, tenure-track appointment. Candidates must present evidence of excellence, or potential for excellence, in teaching and research. The department is primarily looking for candidates with expertise in numerical methods applied to analysis, but specialties complementing other areas of analysis already represented in the department will be considered. These include partial differential equations, functional equations, classical real analysis and harmonic analysis. Primary teaching responsibilities include courses at all levels, including general education courses. Ph.D preferred, A.B.D. considered. Candidates should send a letter of application, curriculum vitae and three lettersof recommendation by February 1, 1993 to Dr. Robert B. McFadden, Chair, Department of Mathematics, University of Louisville, Louisville, KY 40292.

UNIVERSITY OF MARYLAND, COLLEGE PARK - DEPARTMENT OF MATHEMATICS Applications are invited for possible tenure or tenure-track positions in all areas of mathematics (pure, applied, and mathematical statistics) to begin in August 1993. Rank and salary depend on qualifications .Joint appointments with other units, in particular with the Institute for Physical Sciences and Technology, are possible. Exceptionally strong research program necessary. The deadline for full consideration is February 1, 1993. Curriculum Vitae, description of current research,and at least three letters of recommendation should be sent to Professor Raymond L. Johnson, Chairman, University of Maryland, College Park, Department of Mathematics, College Park, MD 20742.

UNIVERSITY OF MICHIGAN - DEPARTMENT OF MATHEMATICS - ANN ARBOR, MI 48109-1003 PROFESSOR D. J. LEWIS, CHAIR - Expect to have 3-5 tenure eligible positions. Searching in particular in Number Theory (preferably Algebraic or Diophantine), Topology, Analysis, Applied Mathematics (with strong interdisciplinary focus). Preference for individuals that would significantly broaden and strengthen areas presently represented. Exceptional research and teaching background required. Applications considered on a continuing basis. Rank determined by experience, salary negotiable. Starting date: September 1993.

UNIVERSITY OF MICHIGAN - DEPARTMENT OF MATHEMATICS - ANN ARBOR, MI 48109-1003 PROFESSOR D. J. LEWIS, CHAIR - Expect to have at least twoT.H. Hildebrandt Research Assistant Professorships. Three-year appointment, reduced teaching load. Also expect to have several three-year terminal assistant professorships. Preference given to persons of any age having the Ph.D. degree less than two years, with a research interest in common with senior faculty. Applicants should have a strong research program and serious commitment to teaching. Application deadline: 4 January 1993. Salary Competitive. Starting date: September1 993.

UNIVERSITY OF MINNESOTA - SCHOOL OF MATHEMATICS - The school of Mathematics may have available one or more tenure track Assistant Professor or tenured Associate or Full Professor positions starting Fall, 1993. PhD or equivalent from a foreign university by the beginning date of appointment, outstanding research and teaching abilities are required. Applications at all levels are invited, but preference will be given to candidates whose research interests are compatible with those of the School. Salary competitive. Consideration of applications will begin 12-1-92. Contact Eugene Fabe, Head, School of Mathematics, University of Minnesota, 206 Church Street S.E., 127 Vincent Hall, Minneapolis, MN 55455.

UNIVERSITY OF MINNESOTA, SCHOOL OF MATHEMATICS - Several temporary or visiting positions at all levels from Instructor to Full Professor may be available for terms ranging from one quarter to two years beginning September, 1993. PhD or equivalent from a foreign university by beginning date of appointment, strong research and teaching abilities are required except for Instructor level which requires M.A. degree or foreign equivalent, ABD preferred. Preference will be given to applicants whose research interests are compatible with those of the School. Salary competitive. Consideration of applications will begin 12-1-92. Contact Eugene Fabes, Head, School of Mathematics, Universityof Minnesota, 206 Church Street S.E., 127 Vincent Hall, Minneapolis, MN 55455.

UNIVERSITY OF MINNESOTA, SCHOOL OF MATHEMATICS - DUNHAM JACKSON INSTRUCTORSHIP - This is a three-year appointment from Fall, 1993 to Spring, 1996 with a teaching load of one course per quarter.Outstanding research and teaching abilities required. Preference will be given to candidates whose research interests are compatible with those of the School. Candidates should have received a PhD or equivalent from a foreign university no earlier than Jan. 1, 1992 and no later than Sept. 15, 1993. Summer School teaching may be available during the summer of 1994 and 1995 to supplement regular stipend. Salary competitive. Consideration of applications will begin 12--1-92. Contact Eugene Fabes, Head, School of Mathematics, University ofMinnesota, 206 Church Street S.E., 127 Vincent Hall, Minneapolis, MN 55455.

UNIVERSITY OF MISSOURI - DEPARTMENT OF MATHEMATICS: Applications are invited for one tenure-track position at the rank of assistant professor beginning in August of 1993. The position requires a Ph.D., quality teaching, and a commitment to a distinguished research career .Selections for the position will be based primarily on demonstrated research achievement in the areas of dynamical systems or modern analysis. Rank and salary depend on experience and qualifications. Send a curriculum vitae along with a letter of application (include E-mail address), and arrange for three letters of recommendation to be sent to: Professor E. Saab, Chair, at University of Missouri, Department of Mathematics, Columbia MO 65211 (E-mail MATHUMC@MIZZOU1.MISSOURI.EDU). The application deadline is December 31,1992, or until the position is filled thereafter. Applications received after February 1, 1993, cannot be guaranteed consideration.

UNIVERSITY OF MONTANA - DEPARTMENT OF MATHEMATICAL SCIENCES - The Department of Mathematical Sciences at the University of Montana has openings for four tenure track Assistant Professorships beginning Fall 1993. One position each in Analysis, Applied Mathematics and Operations Research is available. A doctorate in Mathematical Sciences and a commitment to excellence in teaching and research are required for all positions. Research must be in the areas of interest of current faculty members in the department. The department offers B.A., M.A., M.A.T. and Ph.D.degrees in several areas of mathematics. .Inquiries or.applications.(including resume, official graduate transcript and three.letters of recommendation) should be sent to: Don Loftsgaarden, Chair, Department of Mathematical Sciences, University of Montana, Missoula, MT 59812. Phone: (406) 243-4171. Screening of applicants will begin on January 15, 1993 and continue until all positions are filled.

UNIVERSITY OF NORTH CAROLINA - CHAPEL HILL - DEPARTMENT OF MATHEMATICS Applications are invited for a senior faculty appointment effective Fall 1993. Rank and salary depend on qualifications and budget considerationsg. Ph.D. in mathematics, exceptionally strong research program and commitment to excellent teaching required. Applicants are asked to send a curriculum vitae, an abstract of current research program, and to arrange to have four letters of recommendation sent to Search Committee Chairman, Math. Dept., CB #3250 Phillips Hall, UNC at Chapel Hill, Chapel Hill, NC 27599-3250. Completed applications received by December 31, 1992 are assured of full consideration.

UNIVERSITY OF OREGON - DEPARTMENT OF MATHEMATICS - EUGENE, OREGON 97403-FRANK W. ANDERSON, HEAD - Assistant or Associate Professor tenure track position in pure mathematics beginning September 1993. Preference given to person with research interests that complement those currently represented. Competitive salary with excellent fringe benefits. Send complete resume and three letters. Closing date is January 18, 1993.

UNIVERSITY OF PENNSYLVANIA - DEPARTMENT OF MATHEMATICS - TENURE POSITIONS IN MATHEMATICS - We anticipate that commencing July 1, 1993, there may be one or more tenure positions available in the following areas: algebra, analysis, geometry/topology and discrete mathematics. These positions are for candidates with outstanding, internationally recognized research achievements who are successful teachers of undergraduate and graduate students. Rank and salary will depend upon experience. Write to Personnel Committee, Department of Mathematics, University of Pennsylvania, Philadelphia, PA 19104-6395.

UNIVERSITY OF PENNSYLVANIA - DEPARTMENT OF MATHEMATICS - JUNIOR POSITIONS IN MATHEMATICS - Several positions will be available beginning July 1, 1993. Candidates should have strong research credentials and be recognized as potentially successful teachers of undergraduate and graduate students. Send resume and three letters of reference to the Personnel Committee, Department of Mathematics, University of Pennsylvania, Philadelphia, PA 19104-6395. These are due by December 15, 1992.

UNIVERSITY OF PITTSBURGH - DEPARTMENT OF MATHEMATICS AND STATISTICS -The department invites applications for the following position, which will be available for September, 1993, if funding permits: Assistant Professor of Mathematical Biology. We have a preference for an individual with a strong computational aspect to their research. This is a tenure track position. Requirements include outstanding research accomplishment and potential commesurate with experience, and ability and interest in excellent teaching. Applicants should send a resume and arrange to have at least three letters of recommendation sent to: S. Hastings, Chairman, Department of Mathematics and Statistics, University of Pittsburgh, Pittsburgh, PA 15260. Applications which are complete by January 10, 1993 are assured of complete consideration.

UNIVERSITY OF REDLANDS - DEPARTMENT OF MATHEMATICS - The Department of Mathematics invites applications for one or two tenure-track positions at the assistant professor level beginning September 1, 1993. Responsibilities include teaching six undergraduate courses per year, including computer-based courses; directing student research projects; and engaging in scholarly activity. Requirements include the Ph.D. in mathematics (any specialization) and evidence of excellence in, and commitment to, undergraduate teaching. The University of Redlands, which enrolls 1500 undergraduates, is a selective, private, comprehensive university located in Southern California. To apply, submit a letter of application, a resume, and three letters of reference, two of which must address teaching, to Dr. Allen Killpatrick, Chair., University of Redlands, Department of Mathematics, PO Box 3080, Redlands, CA 92363. Application deadline is 5:00 p.m. February 15, 1993. Department representatives will attend the AMS-MAA Joint Meetings in San Antonio, Texas.

UNIVERSITY OF ROCHESTER - DEPARTMENT OF MATHEMATICS: The Department seeks candidates for a position at the level of Assistant Professor. This position is contingent upon approval by the administration. Applicants showing significant research accomplishments or exceptional research promise, as well as evidence of a commitment to excellent teaching are invited to apply. There is no restriction as to field. In addition to a curriculum vita, candidates should send a summary of research plans, available preprints or reprints, and have at least three reference letters sent to: John Harper, Chairman, Mathematics Department, University of Rochester, Rochester, New York, 14627.

UNIVERSITY OF SASKATCHEWAN; DEPT OF MATHEMATICS AND STATISTICS; SASKATOON, SAK., CANADA S7N OWO: Applications are invited for a tenure-track Assistant Professor position (93T 2-15-2, subject to budgetary approval) commencing July 1, 1993. We require an Algebraist with a well developed research programme who is interested in the supervision of graduate students and with a demonstrated skill at undergraduate teaching. Candidates are encouraged to apply by January 15, 1993 to ensure their full consideration. A current C.V. and 3 confidential letters of recommendation should be sent to J. R. Martin, Head. In accordance with Canadian Immigration requirements, priority will be given to fully qualified Canadian citizens and permanent residents.

THE UNIVERSITY OF THE SOUTH - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE: Tenure-track position in mathematics, to begin Fall 1993, at a highly selective, church-related (Episcopal) liberal arts college of 1100 students located on a 10,000-acre forested domain in the Tennessee uplands. Applicant should have an appreciation for the liberal arts and some interest in computing. The position is at the level of assistant professor, with excellence in teaching and continued interest in research expected. A complete application will include a letter stating one's professional aims, a resume, graduate and undergraduate transcripts, and three recommendations. All should be sent to

Sherwood F. Ebey, The University of The South, 735 University Avenue, Sewanee, TN 37375-1000. Applications received by November 27 will have first consideration.

UNIVERSITY OF TENNESSEE - CHATTANOOGA - DEPARTMENT OF MATHEMATICS - DEPARTMENT HEAD - The University of Tennessee at Chattanooga invites applications for head of the Department of Mathematics. A Ph.D. in a mathematical science and a tleast five years of college mathematics teaching experience are required. Applicants should provide evidence of leadership in curriculum development, teaching, public service and research/scholarlyactivities. In this primarily undergraduate institution, the faculty is expected to exhibit excellence in teaching while maintaining a strong commitment to research and public service. The mathematics department has twenty-two faculty members including a Chair of Excellence in Applied Mathematics. Located in a very scenic metropolitan area of 400,000, UTC has a student enrollment of 8100. Send applications with current vita to: Dr. Irene Loomig; Chair of the Search Committee, Dept.of Mathematics, UTC, Chattanooga, TN 37403-2598. Consideration ofapplications will begin November 1, 1992, and will continue until the position is filled.

UNIVERSITY OF TENNESSEE - KNOXVILLE - MATHEMATICS DEPARTMENT - The Mathematics Department of the University of Tennessee, in an effort to siginificantly improve its research position, sees to fill 3 or 4 tenure-track assistant or beginning associate professorships in several areas. A PhD is required. Some postdoctoral experience is preferred. There will be one and possibly two positions available in Numerical Mathematics; candidates should be well versed in the core areas of Numerical Analysis with research interests in the numerical solution of differential equations. Preference will be shown those candidates working in numerical fluid dynamics. Another position will be offered in differential equations, with preference given to those having expertise in the non-linear qualitative theory of differential equations. Another position will be offered in Stochastic Differential Equationsand related fields of Stochastic Analysis. Employment begins August 1993. Substantial research promise as well as dedication to teaching are paramount. Interested applicants should arrange to have a vita, three reference letters and a research statement sent to Professor John B. Conway, Mathematics Search, University of Tennessee, Knoxville, TN 37996-1300. Email: recruit@novell.math.utk.edu. Review of applications wil lbegin December 1 and will continue until the positions are filled.

UNIVERSITY OF TEXAS - AUSTIN - DEPARTMENT OF MATHEMATICS - For Fall 1993, openings are expected only at the Instructor level. Instructorships at The University of Texas at Austin are postdoctoral appointments, renewable for up to three years. They are restricted to recent Ph.D. recipients: applicants are expected to have completed all Ph.D. requirements by no later than August 31,1993 but not to have received their degrees prior to January 1, 1991. Candidates should have outstanding research ability and a solid commitment to teaching. Strong preference will be shown toward applicants whose research interests are closely allied with those of the permanent faculty. Duties include teaching undergraduate or graduatecourses and conducting independent research. The anticipated salary is $31,000 for the nine-month academic year. Individuals wishing to apply should send a vitae and a brief research summary to Department of Mathematics, The University of Texas at Austin, Austin, Texas 78712, % Recruiting Committee. Transmission of these materials via e-mail to recruit@math.utexas.edu is encouraged. Please do not have any letters of recommendation sent with your applicaion. Following an initial screening, the Recruiting Committee will request additional information, part of which will be letters of recommendation, from selected applicants. Unsolicited letters of recommendation will be disregarded. The screening of applicants will begin on December 1, 1992.

UNIVERSITY OF WASHINGTON - DEPARTMENT OF MATHEMATICS - ACTING ASSISTANT PROFESSOR - One nontenure-track position may be filled. Applicants should have the Ph.D. degree and be highly qualified for undergraduate and graduate teaching and independent research. Applications, including a curriculum vitae, statement of research and teaching interests, and three letters of recommendation, should be sent to Professor Edward B. Curtis, Appointments Committee, Department of Mathematics, GN-50, University of Washington, Seattle, Washington 98195. Priority will be given to applications received before February 1, 1993.

UNIVERSITY OF WASHINGTON - DEPARTMENT OF MATHEMATICS - ASSISTANT PROFESSOR - One tenure-track position may be filled. Applicants should have the Ph.D. degree and b ehighly qualified for undergraduate and graduate teaching and independent research. Applications, including a curriculum vitae, statement of research and teaching interests, and three letters of recommendation, should be sent to Professor Edward B. Curtis, Appointments Committee, Department of Mathematics, GN-50, University of Washington, Seattle, Washington 98195. Priority will be given to applications received before February 1, 1993.

UNIVERSITY OF WASHINGTON - DEPARTMENT OF APPLIED MATHEMATICS - The department is seeking a candidate for a tenure track Assistant Professor position effective September 1993. The department offers the M.S. and Ph.D. degrees in applied mathematics and its teaching responsibilities within the university include advanced undergraduate and graduate level specialty and service courses. The research interests of the current twelve faculty members are strongly focused on applications in the physical and biological sciences, ranging over various aspects of modeling, analysis and computation. All applicants should have an applied mathematics background that is compatible with the departmental teaching requirements and research ambitions. Applicants with an interest in applied scientific computation are especially encouraged to apply; however, all specialty areas within applied mathematics will be considered. A resume and the names of three people familiar with the applicant's qualifications should be forwarded to: Professor Robert E. O'Malley, Jr., Chair, Department of Applied Mathematics, FS-20, University of Washington, Seattle WA 98195. The search committee will contact references when appropriate. Priority will be given to applications received before December 31, 1992.

UNIVERSITY OF WATERLOO - DEPARTMENT OF PURE MATHEMATICS - The Department of Pure Mathematics at the University of Waterloo invites applications for one or more tenure track positions at the Assistant Professor level starting July 1, 1993. For its first appointment the Department is particularly interested incandidates whose research interests are related to Algebraic Geometry, Algebraic Topology or Differential Geometry. A second appointment (tenure track or definite term) may also be made in the above areas or in some area of Analysis. In order to be considered for the position, a Ph.D. is required. An appointment will be offered only to someone with very strong research and teaching qualifications. The University of Waterloo is committed to increasing the number of its female faculty,and therefore applications from women mathematicians are particularly welcome. Duties will include research, and teaching at all levels. Salary will depend on the candidate's qualifications. The deadline for applications is January 15, 1993. An application should contain the curriculum vitae of the candidate plus three letters of reference sent directly from the referees. In accordance with Canadian immigration regulations this advertisement is directed at Canadian citizens and permanent residents of Canada. The University of Waterloo encourages applications from qualified women and men, members of visible minorities, native peoples and persons with disabilities. All appointments are subject to the availability of funds. Please send applications to: Dr. J. W. Lawrence, Chair, Department of Pure Mathematics, University of Waterloo, Waterloo, Ontario, Canada, N2L 3G1.

VANDERBILT UNIVERSITY - DEPARTMENT OF MATHEMATICS - ASSISTANT PROFESSOR - (Pending AdministrativeApproval.) Ph.D. required with two year appointment beginning Fall 1993. This is not a tenure track appointment but is intended for a person with demonstrated research potential who would like to spend time in a department with a vigorous research atmosphere. We are especially interested in someone who works in one of the areas of departmental strengths which include universal algebra, differential equations, approximation theory, operator theory, mathematical biology, applied mathematics, graph theory, and topology. Have vita and four letters of recommendation (including one about teaching) sent to Professor G. F.Webb, Chair, at Vanderbilt University, Department of Mathematics, 1326 Stevenson Center, Nashville, TN, 37240.

VANDERBILT UNIVERSITY - DEPARTMENT OF MATHEMATICS - ASSISTANT PROFESSOR - (Pending AdministrativeApproval.) Specialization in computer related mathematics,approximation theory, or computer aided design. This position is intended for a person whose primary research involves computing. It is an initial three year appointment beginning Fall 1993 (renewable; tenure track.)

Outstanding research potential and evidence of effectivet eaching is required. Have vita and four letters of recommendation sent to Professor G. F. Webb, Chair, at Vanderbilt University, Department of Mathematics, 1326 Stevenson Center, Nashville, TN, 37240.

VANDERBILT UNIVERSITY - DEPARTMENT OF MATHEMATICS - ASSISTANT PROFESSOR - (Pending Administrative Approval.) Specialization in an area of analysis or applied mathematics. We are especially interested in someone who works in differential equations, operator theory, mathematical biology, or approximation theory. Initial three year appointment beginning Fall1993 (renewable; tenure track.) Outstanding research potential and evidence of effective teaching required. Have vita and four letters of recommendation sent to Professor G. F. Webb, Chair, at Vanderbilt University, Department of Mathematics, 1326 Stevenson Center, Nashville,TN, 37240.

VASSAR COLLEGE - DEPARTMENT OF MATHEMATICS - Applications are invited for two tenure-track positions at the level of assistant professor starting Fall 1993. Candidates must have a Ph.D. in mathematics and a strong record or potential in both research and teaching. Teaching load is three courses one semester and two the other. Mathematicians whose research interests are close to those of the department will be given some preference. Candidates should send a letter of application, a curriculum vita and arrange to have three letters of recommendation sent to Peter Pappas, Chair, Dept. of Mathematics, Box 257, Vassar College, Poughkeepsie, NY 12601. Applications received by January 15, 1993 are assured of full consideration.

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Applications are invited for an anticipated tenure-track appointment at the Assistant Professor level in the general area of Dynamical Systems beginning with the 1993-94 academic year. A Ph.D. and strong research potential are required. The likelihood of productive interaction with current faculty members, such as the group in partial differential equations and continuum mechanics, will be a consideration. Position involves teaching duties of approximately six hours per week.Evidence that candidate is or will become an effective teacher should be included in application material; in particular, at least one reference letter should address this issue. Send a vita and arrange to have three letters of reference submitted to Kenneth Hannagen, Chair, Dynamical Systems Search, Mathematics Department, Virginia Tech, Blacksburg, VA 24061-0123. Applications will be accepted for as long as there is a possibility of making an appointment of until 3/15/93. Those completed by 1/1/93 will be included in the first round of evaluations.

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Applications are invited for an anticipated tenure-track position in Geometry (differential or algebraic, or related areas) beginning Fall 1993. Because we seek applicants who will be able to develop a strong case for eventual promotion and tenure, preference will be given to those with postdoctoral or instructorship experience and established research programs. Please send vita and brief description of research and have three letters of reference sent to Prof. William Floyd, Chair, Geometry Search Committee, Department of Mathematics, Virginia Tech, Blacksburg, VA 24061-0123. At least one letter should address the applicant's qualifications as a teacher. Applications will be accepted until March 15, 1993, or until position is filled. Applications completed by January 1, 1993 will be included in the first round of evaluations.

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY - DEPARTMENT OFMATHEMATICS - The Department of Mathematics is actively seeking applications for an anticipated tenure-track position at the Assistant Professor level in the area of discrete mathematics, combinatorics, and graph theory beginning with the 1993-1994 academic year. A Ph.D. in mathematics, strong research potential, and good teaching credentials are required. Preference will be given to candidates with post doctoral experience. Applications will be accepted for as long as there is a possibility of making an appointment or until March 15, 1993. Those completed by January 1, 1993 will be included in the first round of evaluations. Applicants should send a curriculum vitae, and arrange to have three letters of reference sent to Professor Charles Parry, Chair, Discrete Math Search Committee, Department of

Mathematics, VPI&SU, Blacksburg, VA 24061-0123. At least one letter should address the applicant's teaching credentials.

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - We are seeking applicants for an anticipated tenure-track appointment at the Assistant Professor level in the area o fcomputational Mathematics/Numerical Analysis beginning with the 1993-94 academic year. We seek applicants with a strong research potential as well as the ability to be an effective teacher. A vita, brief description of research interests, three letters of recommendation including at least one which addresses teaching, and any supporting materials should be sent to Janet S. Peterson, Chair, Computational Mathematics Search Committee, ICAM, Wright House, Virginia Tech, Blacksburg, VA 24061-0531. Applications will be accepted for as long as there is a possibility of making an appointment or until 3/15/93; however, applications completed by 1/1/93 will be included in the first round of evaluations.

WASHINGTON UNIVERSITY - ST. LOUIS - Tenure track position open beginning Fall 1993. Rank and salary depend on experience and qualifications. Selection will be based on research experience and potential in field represented in the Department, as well as on teaching ability. The Department is especially interested in researchers in the fields of algebra, analysis, differential geometry and differential topology. Send a letter of application and vitae (including list of publications), and have three letters of reference sent, to Washington University in St.Lous, Department of Mathematics, One Brookings Way, Campus Box 1146, St.Louis, MO 63130-4899. Deadline for completed applications is January 1, 1993. Late applications will be considered until the position is filled.

WAYNE STATE UNIVERSITY - DEPARTMENT OF COMPUTER SCIENCE - Faculty Positions. The Wayne State University Department of Computer Science invites applications and nominations for several anticipated, subject to budgetary approvals, tenure-track positions at all ranks. Candidates from all areas of specialiazation in computer science or computer engineering will be considered; however, the department will prefer candidates in the areas of expertise which overlap with the existing research strengths in computer graphics, virtual reality, modeling and data analysis, database systems, software engineering, artificial intelligence, computer vision and image processing, distributed systems and parallel high performance computing, neural networks, biocomputing, numerical methods and natural language processing. Candidates shouldhave a PhD in computer science/engineering or a closely related field, a strong interest in, and commitment to, both research and teaching, and demonstrated potential for obtaining external research funding. Wayne State University, located in Detroit's Cultural Center, is an urban, comprehensive research university serving 34,000 students. The Department of Computer Science has sixteen faculty members, approximately 250 graduate students and 350 undergraduates. It offers the Ph.D., M. S. , M.A., B.S., and B.A. degrees. The faculty have ties to industry (including local automotive and computer companies) and to several institutes for high technology associated with the University. Several research projects are currently being funded by NSF and NASA. Applicants should send a letter of intent, a statement of research and teaching interest, resume and names of at least three references, their addresses (including e-mail address) and telephone/fax numbers to: Dr.Narendra S. Goel, Chair, Department of Computer Science, Wayne StateUniversity, 431 State Hall, Detroit, MI 48202. Phone: (313) 577-2477, Fax: (313) 577-6868, e-mail: ngoel@cs.wayne.edu For full consideration, applications should be submitted by November l, 1992. However,applications will be accepted until the positions are filled.

WAYNE STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Applications are invited for an anticipated tenure-track position at the rank of Assistant or Associate Professor. There is also the possibility of Visiting positions for 1993-94. Ph.D. in mathematics required. Excellence in research and teaching expected. Applications should include a signed, detailed vita, description of current research interests, and three letters of recommendation.

WESTERN MICHIGAN UNIVERSITY - DEPARTMENT OF MATHEMATICS AND STATISTICS - Western Michigan University seeks applications for a tenure-track assistant professor position in

mathematics for Fall 1993, pending budgetary approval. Position requires a Ph.D. degree, or evidence of imminent award, in mathematics with a specialization in algebraic topology with interest in combinatorics preferred. Applicant must demonstrate potential for teaching, scholarship and publication. Send letter of application, vita, academic transcripts and three letters of recommendation to Ruth Ann Meyer, Chair, Mathematics and Statistics Department, Western Michigan University, Kalamazoo, MI 49008. Review of applicants will begin December 1, 1992 and continue until position is filled.

WEST VIRGINIA UNIVERSITY - DEPARTMENT OF MATHEMATICS -CHAIRPERSON -
Applications and nominations are invited for the position of Chairperson. The position requires a Ph.D. in mathematics or its equivalent, administrative experience, and research credentials sufficient to justify a tenured appointment at the Associate Professor or Professor level. It is expected that the successful applicant will continue his/her research program while serving as chairperson. The Department is searching for a person with a desire for administrative responsibility who will continue to strengthen the Department's research program while maintaining a substantial commitment to quality teaching The Department consists of 32 faculty, 5 support staff, and 25 graduate teaching assistants, and offers the B.A., M.S. and a newly established Ph.D. degree. The Department is located in newly refurbished facilities that include its own departmental research library, a mathematics learning center with CAI capacity and fully integrated computer offices, classrooms and computer laboratories. Faculty have direct access to the University's mainframe computer facilities and to Internet. The Department has faculty active in various areas of pure and applied mathematics and in mathematics education West Virginia University has an enrollment of 22, 500. Morgantown is a culturally diverse college community with a population of about 40,000 and is located on the Monongahela River, 70 miles south of Pittsburgh and 200 miles west of Washington D.C. Applicants should provide a vita and the names of five references. Applications and inquiries should be sent to Dr. Bernard Cooper, Benedum Professor of Physics, Chair of the Search Committee, 201 Woodburn Hall, West Virginia University, PO Box 6286, Morgantown, WV 26506-6286. Screening of applicants will begin January 15, 1993 and will continue until a successful candidate is chosen.

WHEATON COLLEGE - DEPARTMENT OF MATHEMATICS -The Mathematics Department at Wheaton College invitesapplications for a two-year renewable tenure-track assistant professorship in computer science beginning September 1993. Requirements are a Ph.D. in computer science or a related field, a commitment to quality teaching, and active scholarly activity. Teaching experience preferred. We offer an interdisciplinary Math/ComputerScience major and a Computer Studies minor. Wheaton College is a private liberal arts college of 1200 students situated in a small New England town between Providence, Rhode Island and Boston. Send a letter of application, vitae, and three letters of recommendation to: Rochelle Leibowitz, Chair, Mathematics Department, Wheaton College, Norton, MA 02766. Deadline: December 15, 1992.

WILLIAMS COLLEGE - DEPARTMENT OF MATHEMATICS - Williamstown, Massachusetts, 01267. One or possibly two anticipated positions, one of them preferably in statistics, probably at the rank of assistant professor, for Fall, 1993. Strong commitment to both teaching and scholarship is essential. Please have a vita and three letters of recommendation on teaching and research sent to Hiring Committee. Formal evaluation of applications will begin November 15, 1992, and continue until the postions are filled.

YALE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Yale University applications accepted for Gibbs Instructorships for PhD's with outstanding promise in research. 2-year appointments starting July 1, 1993. Light teaching load. Applications and supporting materials must be received by January 1, 1993. Offers will be made during February. Salary at least $37,500. Request application from: Ms. Carolyn Curtis, Administrative Assistant, GibbsCommittee, Department of Mathematics, Box 2155, Yale Station, New Haven, CT 06520.

Association for Women in Mathematics

Individual Membership Form

Date..................19........

Please complete this form and return it as soon as possible. Your membership will be updated immediately. See reverse side to determine what membership category you are eligible for. Subscription to the AWM Newsletter is included as part of your membership. Thank you for taking the time to complete this new form.

Please indicate below how your name 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

Electronic Mail Address (if any): _____

Address Change? _____   **New Member?** _____

Telephone numbers: Home: (   )_____

Office: (   )_____

Degrees, with institutions and dates:

_____

_____

_____

Present position: _____

Firm or institution: _____

City	State	Zip/Country

Primary Fields of Interest. Select up to five from the list on page 2.

_____ _____ _____ _____ _____

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

Check one: _____yes _____no

Signature: _____

Membership Categories

Please read the following to determine which membership category you are eligible for, and then indicate below the appropriate category. AWM membership year is October 1 to September 30th

NOTE: ALL CHECKS MUST BE DRAWN ON US BANKS AND BE IN US FUNDS

Dues Schedule 1992/1993 (Please note changes from last year):
NOTE: Membership year runs from October 1, 1992 through September 30, 1993.

Regular Membership....................................$40   _____

Family Membership.....................................$55   _____

(Base dues $25 Regular, $40 Family plus $5 Prize Fund and $10 General Fund)

Contributing Membership...............................$100   _____

Student, Retired, or Unemployed Membership............$8   _____

All Foreign Memberships INCLUDING CANADA & MEXICO add $8   _____

                                           TOTAL DUES: _____

Fields of Interest

Please consult the list of major headings of the 1991 Math Subject Classification and the categories specific to AWM.

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 & 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 K-theory
20 Group theory
22 Topological groups, Lie groups
26 Real functions
28 Measure 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; optimization
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, electromagnetic theory

80 Classic thermodynamics, heat transfer
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
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 women in math sciences
008 Other (please specify):

_____

Association for Women in Mathematics
Box 178 Wellesley College
Wellesley, MA 02181
(617) 237-7517

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 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.

_____
_____
_____
_____

Address change? _____

Department Telephone Number: _____

Chair: _____
       Last name   First   Middle initial

Telephone number: _____

Electronic mail address: _____

Membership Categories

Please read below and indicate the category for which you are applying. AWM membership year is October 1 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

List names and addresses of student nominees on opposite side of this form.

AWM
ASSOCIATION
FOR WOMEN IN
MATHEMATICS

Box 178, Wellesley College, Wellesley, MA 02181

Marie A. Vitulli
Dept. of Mathematics
University of Oregon
Eugene OR 97403