IN THIS ISSUE

PRESIDENT'S REPORT

San Antonio

Most of you will receive this only after the January meeting, so I hope I saw you there. As is now becoming traditional, AWM has a very busy Tuesday and Wednesday planned, with the workshop on Tuesday and the Noether lecture and dinner, panel, business meeting with Hay Award presentation, and party all on Wednesday! All this will be reported in the March-April *Newsletter*. Since this is my last (gulp!) president's report, I'll thank the panelists in advance: Ann Boyle, Loki Natarajan, Margaret Murray, Edith Starr, and Robert Williams. Thanks also to the Hay Award committee, Mary Ellen Rudin, Sylvia Bozeman and Barbara Faires. I can't resist congratulating the Hay Award winner (you know who you are). A great perk of my AWM job is the pleasure of notifying a fabulous woman that she is being recognized for her achievement!

Lovely Gesture

At its 25-year banquet, the AMS awarded a $200 certificate to Lee Lorch in recognition of his years of membership. What did Lee do? He traded it in for two $100 certificates, one for NAM and one for AWM, to be used to benefit minority women, either faculty or students. Thanks again, Lee!

MAA Workshop

Cora Sadosky and I attended an MAA workshop on women in the mathematical sciences October 31 – November 1, organized under the leadership of Virginia Knight and Carol Lacampagne, along with Deborah Haimo and Marcia Sward of course. Representatives from many groups concerned with women in math and in science reported on their organizations' activities, much interesting background material was available, and then the meeting turned to the role of the MAA. I was heartened by the MAA's attention to women, as well as with their interest in coordinating efforts with AWM. There is so much out there to do....

And on the topic of the MAA, they have received a three-year grant totalling $225,000 from the Department of Energy to allow broad dissemination of career materials, including distribution to high school counsellors. Again they are coordinating this work with the other societies via a steering committee. AWM's former Resource Committee chair Jenny Baglivo has been asked to join, due to her major hand in producing *Careers That Count* (which is still the best thing out there, in the view of someone who had nothing to do with its production).

NSF and AWM

The AWM-NSF travel grant is alive and running, thanks to the selection panels and Jodi Beldotti. Most recently, awards went to Ying Sue Huang, Margaret Bayer, Virginia Flack, Eve Torrence, and JoAnn Cohen. Meanwhile Jodi and I have been working, with help from Deborah Lockhart at NSF, to clarify the eligibility rules. The announcement in this issue includes some new details; please read it carefully before applying. The grant is funded through DMS, and its purpose is to enable more women to attend meetings in mathematical research as sponsored by DMS. This regrettably precludes AWM's funding important areas such as most of mathematics education and history of mathematics. I hope that AWM will seek additional forms of funding in the future. As I see it, women are still not getting a fair piece of the funding pie, and we shouldn't hesitate to ask for *more*! The foundering, then abandonment, of the flat rate experiment at NSF was disappointing to Cora and to me, since — whatever the flaws — it represented a change in attitude toward funding which could work to the advantage of mathematics. In particular, I am certain that an increase in the number of grants would benefit women mathematicians.

Oh Barbie, Barbie, Barbie

As Anne mentioned in the last *Newsletter*, there was a lot of heat generated by Barbie's big mouth. Many of us called and wrote Mattel in protest — Mattel's President is a woman, Jill Barad. I was also amused at how many of the AWM officers reacted virtually instantly with "seek reparations!" On behalf of the fundraising committee, Eleanor Palais has written a follow-up, asking for Mattel to get involved directly in supporting our activities. We'll see. I take heart in all the outcry and outrage sweet Barbie caused with her "math class is tough"; however, some of the letters and editorials generated by the furor underscore how little things have changed. One favorite from South Bend (thanks (?) to Nancy Stanton for sending it along) agrees with Barbie: "[Math]'s a subject that involves logical progression of thought to a specific conclusion. Math is not a subject women can solve with their emotions."

What's the Problem?

In the category of last licks (i.e., from my bully pulpit), I find it extremely puzzling, excuse the pun, that the American mathematical community has little place for girls and women among its premier problem solvers. Problem solvers are a special breed, whether born or nurtured; the best ones (or rather some of the best ones) show up in their early years on Math Olympiad teams and Putnam Exam lists. Some become mathematicians; others don't. Mathematicians are ambivalent about the merits of such competitions, but most agree that special talent in this area is certainly dazzling to behold. The Putnam competition is offering for the first time some special recognition for women; I have mixed feelings about this, but the perceived need for such an award is indicative of the problem. My spies tell me that the Math Olympiad system in this country, for all its successes, is giving long-overdue attention to its singular failure with girls. (Other countries have girl Olympiad stars. The U.S., to its disgrace, does not!) What set me off? A mild event: the Problems Sessions of the December '92 *Math Monthly*, in which the three editors thank 71 referees for their time and help. These 74 mathematicians have something in common ... guess what!

What a Long Strange Trip It's Been

Nearly twenty-one years ago, on the occasion of the birth of my first daughter, a senior colleague wrote his best wishes, and included something like this: "I as an old parent have learned not to try to tell a new parent what it's like — it wouldn't help, and anyway you would never believe me." So it is with being President of AWM; Jill, Rhonda, and my other predecessors were very helpful, but did not try to predict what I would encounter. I only hope to be half as useful to Cora as they were to me, while taking the above warning to heart. In the style of Queen Elizabeth II's reference to 1992, I must say that I will not look back on these past two years with undiluted pleasure. There have been major disruptions due to changes in personnel, the need for a new home, and more generally the growing pains of our organization as we became of legal age. I hope AWM never again has to endure a year of four treasurers and two executive directors! But it has been fabulous fun and learning for me as well, and sometimes, alas not always, I was able to learn something in time to put it to use! Best of all has

been getting to know many wonderful women (and even a few men) — our friends at Wellesley, the members I see at meetings or hear from throughout the year, and especially all the officers past and present who are constantly pitching in with ideas, skills, and hard work. My own deepest thanks are due to Bettye Anne, Jenny, Jill, Judy, Anne, Tricia, Jodi and Cora, without whom AWM would never have survived. And now the future AWM will be very likely in a new home in a new part of the country (along with Bill and Hillary?), with new excitement and challenges.

Carol

Carol Wood
Middletown, CT
December 2, 1992

THANKS to the many folks at Wellesley who have helped us so much!

Comptroller Department: Amy Coch, Ruth Muller, Joan Gallagher, and Judy McKenzie

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Science Center: Roz White, Barbara Lohengren, Barbara Schultz, Patricia Cochran, Bob and Joe

Infirmary: The administrator and the nurses in the Infirmary; also Kathy in the Stone Center office, Bill, and Frances Brown

Post Office: Fran and Jo

Administration: Pam Gentile, Will Reid, and Nannerl Keohane

Math Department: Marty Magid, Lauren Rose, Ann Barrett, Patrick Morton, Milja Poe, Fred Schultz, Alexia Sontag, Helen Wang, Robert Winters, Robert Gutschera, Barbara Tabal, Phil Hirschhorn, David Gillman, Charles Bu, and Joan McCarthy

Academic Computing: Susan Hafer, Steve Barbell, Lisa Demers, and the help desk staff

Other departments: Barbara Beatty, Paula Raymond, Susan Bailey, and Barbara Boger

LETTER TO AWM

I am at Purdue University this year, on an NSF Visiting
Professorship for Women award, and I would like to encourage
more women to apply. It is a very nice arrangement, in that you
can concentrate on your research with a reduced teaching load, and
at the same time, your visibility increases, and you help other
women realize their potential in mathematics and science.

I would like to particularly encourage those women who have
applied before and were turned down on the basis of their
"interactive component," the part of the proposal that details what
you intend to do to help other women. It was my experience to be
turned down for this reason, and since then I've heard many others
had the same experience. At the time I was pleased by comments
made about my research by mathematicians, but felt shattered by
the comments made about my interactive component by a panel of
women in various disciplines, so much so that it took several years
for me to get my nerve up to apply again (and I still feel the
scoring on that item that year was a bit random). I now realize that,
although they should have jumped at the chance to have someone
do all that I had volunteered for, it was better for me that I received
the award with a more modest interactive proposal, so that I have
more time to advance my research.

This time around, I proposed to invite several prominent
women mathematicians in my area and to be sure they interacted
with the women graduate students here. Also I am holding regular
meetings with the women graduate students and attending campus-
wide meetings of women in science. I am teaching a course for
upper-level undergraduates and participating in seminars, and I
will give a colloquium. Since this university has a large number of
women graduate students, especially in my area, and there are very
few women on the faculty, these are valuable things to do. I heard
from last year's recipients of many other possible activities:
campus-wide programs for women in science, special mentoring of
undergraduate as well as graduate students, even interaction with
elementary students. The theme of inviting other women visitors
was repeated quite a lot; it seems to be a well-regarded idea. Also
it is important to give advanced seminars and colloquia and
graduate courses, to gain your colleague's respect. (Some of the
recipients felt the VPW's should teach graduate rather than under-
graduate courses, but here at Purdue, the chair felt it would be
helpful for female math majors to have a female instructor, and he
was willing to share in my salary if I taught an undergraduate
course.)

I emphasized in my application my established record of
helping women at my institution. In any given year, the pool of
applicants is different from other years, and the panel which
selects the recipients also changes. It is worth applying and reap-
plying each year. Also I noticed that the recipients seemed to have
communicated with the NSF staff of this division a lot. The staff
(presently headed by Dr. Margrete Klein, formerly by Miss Lola

Rogers) seem very willing to help with applications and give advice.

The deadline for applications is November 1, and the application needs to come from your prospective host institution. It is too late to apply for next year, but it is not too early to start planning for 1994-95, especially if you need to arrange a leave for your entire family. I was lucky that my husband had a sabbatical leave that he could take or not take, depending on whether or not I received the award.

Finally I believe that this is a good program that we all should support. I would like for NSF to continue to offer it and for outstanding women researchers to apply for awards.

In summary, please apply, and good luck!

Sincerely, Sylvia Wiegand

SIMONS WINS AWARD

Computer Professionals for Social Responsibility (CPSR) announced that IBM researcher Barbara Simons is the 1992 winner of the Norbert Wiener Award for Social and Professional Responsibility. The prestigious award is given annually to a distinguished computer professional who has, through personal example, demonstrated a deep commitment to the socially responsible use of computing technology. Simons was honored at CPSR's annual meeting banquet on October 17.

"Barbara Simons was the board's unanimous choice for this year's award," said Stanford professor and CPSR board president Eric Roberts. "In addition to her active research career, Barbara has worked for years to ensure that computer science benefits all of society. She has been centrally involved in projects to increase participation by women and minorities in computing, in defending human rights of computer scientists, in developing research policies that are more responsive to society's needs, and in alerting the public to the dangers of high-tech weapons systems."

"I'm thrilled," said Simons. "I believe that CPSR, in recognizing the work I've been doing by honoring me with the Norbert Wiener award, emphasizes the significance of those issues."

A longtime CPSR and Association of Computing Machinery (ACM) leader, Simons served as chair of the ACM Committee on Scientific Freedom and Human Rights and was elected secretary of the ACM in 1990. Simons was the principle organizer of the 1985 debate "SDI: How feasible? How useful? How robust?" She was the co-founder of the University of California, Berkeley, Computer Science Department Reentry Program for Women and Minorities. Also, Simons chaired a session on federal funding of science at the 1989 meeting of the American Association for the Advancement of Science.

Simons received her Ph.D. in computer science from University of California, Berkeley in 1981 and has worked for IBM since 1980. Dr. Simons is well known for her research on algorithms, especially in the areas of scheduling and graph theory. She received an IBM Research Division Award for her work on clock synchronization.

The Norbert Wiener Award was established in 1987 in memory of Norbert Wiener, who was the originator of the field of cybernetics and a pioneer in looking at the social and political consequences of computing. Author of the book *The Human Use of Human Beings*, Wiener began pointing out the dangers of nuclear war and the role of scientists in developing more powerful weapons shortly after Hiroshima.

Founded in 1981, CPSR is a national, non-profit, public interest organization of computer scientists and other professionals concerned with the impact of computer technology on society. With offices in Washington, D.C. and Boston, CPSR's members provide the public and policy makers with expert testimony and assessments on the power, promise, and limitations of computer technology.

For more information about CPSR, call 415-322-3778 or send email to cpsr@csli.stanford.edu.

AWM ELECTION

It is an odd-numbered year, so it is time for another AWM election. This year the Nominating Committee will be choosing candidates for President-Elect and three Members-at-Large. If you have suggestions for any of these officers, send them to our new President, Cora Sadosky (Department of Mathematics, Howard University, Washington, DC 20059), by February 15th.

QUERIES

A member would like to know whether there are schools with a sexual harassment/discrimination committee on a departmental level, and if so how the committee is set up. They are trying to create one at her school and are looking for ideas and prototypes. The idea is to put together a committee that could solve problems within the department rather than through the university-wide process.

An AWM member has recently relocated to Canton, Michigan. She would like to identify other members in the Detroit area.

A member in Santa Monica is looking for someone to work with. She received her Ph.D. from Brandeis in algebraic geometry. Her current work involves biomechanics. Also, she would like to meet other "women who do mathematical research to give each other support."

Several women undergraduate students at Clark Atlanta University are interested in participating in summer research programs. They would like to know more about summer mathematics research opportunities.

Send replies to any of these queries to Jodi Beldotti at the Wellesley address.

NSF-AWM TRAVEL GRANTS FOR WOMEN

The objective of the NSF-AWM Travel Grants is to enable women to attend research conferences in their fields, thereby providing a valuable opportunity to advance their research activities and their visibility in the research community. By having more women attend such meetings, we also increase the size of the pool from which speakers at subsequent meetings may be drawn and thus address the persistent problem of the absence of women speakers at some research conferences.

Travel Grants. These grants provide full or partial support for travel and subsistence for a meeting or conference in the applicant's field of specialization. A maximum of $1000 for domestic travel and of $2000 for foreign travel will be applied. International travel must be on U.S. flag carriers.

Eligibility. These travel funds are provided by the Division of Mathematical Sciences of NSF, and the research conference must be in an area supported by DMS. For example, this includes certain areas of statistics, but excludes many areas of mathematics education and history of mathematics. Applicants must be women holding a doctorate (or equivalent experience) and having a work address in the U.S. (or home address, in the case of unemployed mathematicians). Anyone who has been awarded an AWM-NSF travel grant in the past two years or who has other sources of external funding, such as a regular NSF grant, is ineligible. Partial institutional support does not however make the applicant ineligible.

Target Dates. There will be three award periods per year, with applications due February 1, May 1 and October 1. An applicant should send *five copies* of 1) a description of her current research and of how the proposed travel would benefit her research program, 2) her curriculum vitae, 3) a budget for the proposed travel, and 4) information about all other sources of travel funding available to the applicant, to: Jodi L. Beldotti, Executive Director, Association for Women in Mathematics, Box 178, Wellesley College, Wellesley, MA 02181; (617) 237-7517.

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.

IOWME STUDY GROUP PRESENTATIONS AT ICME-7

The International Organization of Women and Mathematics Education (IOWME) had a full slate of activities at ICME-7. The program was organized around two themes: "Theoretical models for addressing gender differences in mathematics" and "Cross-cultural issues in gender and mathematics education." Presentations were well attended. I would estimate attendance at around 200 for each group of sessions, probably 85% women. Speakers represented fifteen different countries.

The "Theoretical models for addressing gender differences in mathematics" theme began with a panel discussion exploring four different perspectives: intervention, segregation, discipline, and feminist. Teresa-Anne Mashego (South Africa) introduced the intervention perspective through her discussion of ways to relieve mathematics anxiety. The segregation perspective was examined by Charlene Morrow (U.S.A.), who stressed the importance of women's colleges for the mathematics education of women. She pointed out that women's colleges provide the undergraduate education for 43% of the mathematics and 50% of the engineering Ph.D.'s awarded to women in the U.S. The discipline perspective was explored by SharanJeet Shan-Randhawa (England), who discussed the compounding of the gender issue when racial inequities are involved. The feminist perspective, discussed by Sue Willis (Australia), focused on the power of a reformed mathematics curriculum in solving gender problems in school mathematics. In Western Australia where such reform is in place, girls and boys do about equally well in mathematics, and 95% of the girls vs. 97% of the boys take year 12 college preparatory "maths." The main gender related difference is that boys are more likely to take "double maths" (both pure and applied) than girls.

The next day, eight break-out sessions were held on the four perspectives of the theme. Intervention programs that were discussed included a Canadian workshop for teachers and counsellors aimed at changing the attitudes of women and girls toward mathematics, demystifying the context in which students learn mathematics, and developing a feminist pedagogy (Helene Kayler, Louise Lafortune and Claudie Solar); a German project to develop

teacher-training materials on girls and computers (Cornelia Niederdrenk-Felgner); a Swedish project to network women in mathematics (Barbro Grevholm); and an Australian project to provide a hands-on remedial mathematics program for students who intended to study statistics (Pamela Shaw).

The segregation perspective was represented by the U.S. SummerMath program for high school girls (James Morrow) and the METRO achievement program for Chicago girls (Denisse Thompson). The discipline perspective included a discussion of Australian gender-inclusive calculus curriculum (Mary Barnes) and classroom strategies and curriculum to benefit girls (Joanna Higgins); an English look at what mathematics women choose to study, what gender differences in style or process when teaching or researching they perceive, and what differences in preferred learning styles for mathematics there may be (Leone Burton); and a U.S. report on the findings of recent studies and reports which suggest ways to obtain "critical masses" of women at the graduate level (Lynn Friedman).

The feminist perspective was offered by two U.S. discussions of *Women's Ways of Knowing* and its implications for teaching mathematics from a feminist point of view (Judith Jacobs and Joanne Rossi Becker), a program from the Netherlands to develop materials in the "mathematics and emancipation" project for teacher training (Marja Meeder), a Canadian discussion of feminist theories underlying research and intervention (Roberta Mura), and discussion of the influence of "mathematics culture" on gender imbalance (Carole Lacampagne, U.S.A., and Marjolijn Witte, Netherlands).

The Friday panel tackled cross-cultural issues in gender and mathematics education, looking at theoretical approaches to addressing gender imbalance from a less Eurocentric point of view. Panelists included Neela Sukthankar (Papua New Guinea), Saleha Naghmi Habibullah (Pakistan), and Hanaka Senuma (Japan). Gender differences in mathematics performance were discussed by several panelists. Such differences favor boys in England, while no such differences are noted in Scotland (John Searl). Ethnicity (immigrant vs. native Hawaiian) is the major factor in mathematics performance differences in Hawaii. Similar differences between non-Maori and Maori New Zealanders were found (Sharleen Denise Forbes). Questions were raised as

Carole B. Lacampagne, U.S. Department of Education, Office of Research

to whether intervention strategies aimed at the dominant culture can be effectively applied to minority groups.

Small group discussions on these issues were held on Saturday. BerinderJeet Kaur (Singapore) reported performance differences favoring boys. Margaret Morton and Barbara Reilly (New Zealand) discussed factors affecting performance differences in the calculus. Lindsay Anne Tartre (U.S.A.) looked at links between spatial skills and mathematical performance.

Traditional gender roles may severely impede women from receiving good mathematics educations, concluded Pat Hiddleston (Malawi), while Gurcharn Singh Kaeley (Papua New Guinea) reported that females from matrilineal communities of the Island States of the South Pacific outperform males in mathematics. Gender issues in the world of work were discussed by Mary Harris (England) and Betty Johnston (Australia). Lastly, SharanJeet Shan-Rhandawa (England), discussed her teaching from a feminist perspective, where she is faced with the double burdens of racism and sexism.

EDUCATION COMMITTEE

Robert Meyer (University of Chicago) has been doing research on the contribution of math-related and applied vocational courses to the math proficiency of junior and senior high school students. As a result of his research, he recommends a systemic reform of high school curricula in which math skills are taught in applied contexts and not only as abstract principles. The research differs from previous studies in that it is based on a formal statistical model of the determinants of growth in mathematical achievement. This model explicitly addresses the problems created by measurement error in achievement testing on the prior (sophomore) level. The following column is excerpted from his discussion paper, "Applied Versus Traditional Mathematics: New Econometric Models of the Contribution of High School Courses to Mathematics Proficiency."[*]

Introduction

Given the failure of most states to implement the ambitious math and science reforms articulated in *A Nation at Risk*, what can be done to promote development of mathematics skills in secondary schools?

To answer this question, it is necessary to identify the factors that do, in fact, contribute to mathematics learning. In light of the current focus on course-taking requirements, this paper concentrates on identifying the contribution of secondary school courses to mathematics proficiency. The major new finding is that mathematics learning is substantial in many courses other than traditional mathematics courses, particularly for the most academically disadvantaged students, the group that takes the least amount of traditional mathematics. Moreover, many "math-related" courses are in subjects such as vocational education that are quite popular with students, particularly in contrast with math courses. These empirical findings indicate that learning mathematics in an applied context is a viable alternative or complement to enrolling in traditional mathematics. In the concluding section of this paper I draw on these findings to articulate a new curriculum-wide, systemic strategy for spurring growth in mathematics proficiency. This approach rejects the traditional view as exemplified in *A Nation at Risk*, that mathematics instruction is the sole province and responsibility of high school mathematics departments. The evidence suggests that given existing courses, a systemic approach to mathematics learning — in particular, shared responsibility for math instruction across vocational education, science and traditional mathematics — could more than triple the mathematics learning of academically disadvantaged high school students. Presumably, new vocational and applied science courses, explicitly designed with a mathematics focus, could generate even more impressive gains. The idea of integrated academic and vocational education is not, of course, without precedent. Writing-across-the-curriculum programs, which require that writing skills be taught in all courses, not just English, reflect a similar motivation.

The data used in this study were derived from the sophomore cohort of the *High School and Beyond* study, a nationally representative sample of tenth grade students of 1980. Participants in the study were surveyed and tested during the spring of 1980 and again two years later. College-bound and non-college-bound students differed sharply in terms of their average coursework in mathematics and science. College-bound graduates earned two and a half times as many credits in mathematics and science as non-college-bound graduates. In fact, non-college-bound graduates took only slightly more mathematics and science than dropouts.

College-bound graduates also tended to take more advanced mathematics courses than non-college-bound students.

These numbers suggest that from the limited perspective of mathematics-skills development, the effectiveness of math-related and non-math-related vocational education is especially important for non-college-bound students. During their junior and senior years the non-college-bound graduates took roughly equivalent amounts of mathematics and math-related vocational education (about one semester in each), but five to six times as much non-math-related vocational education (about six semesters).

Results of the Research

Results of the research demonstrated, as expected, that participation in mathematics courses significantly enhances mathematics proficiency. The finding lends support to the common sense recommendation in *A Nation at Risk* that high school students should be required to take additional mathematics courses. But, the analysis also demonstrates that the development of mathematics skills is substantial in certain kinds of vocational-technical courses, quantitatively oriented science courses such as chemistry and physics, and applied math courses such as business and consumer mathematics. In other words, learning mathematics in an *applied* context is a viable alternative or complement to enrolling in traditional mathematics. This finding is particularly important for non-college-bound and academically disadvantaged students, who tend to take the minimum amount of required mathematics but substantial amounts of vocational education. It is also important for college-bound students, a group that actually takes more vocational education than mathematics in high school. The research suggests, however, the need to improve the mathematical rigor of the math-related vocational courses and specific vocational math courses taken by non-college-bound students.

Conclusions

The next wave of academic reforms should encourage *systemic* reform of much of the high school curriculum, in particular, vocational education, science, and mathematics. The current reforms implicitly and mistakenly assume that mathematics instruction is the sole province and responsibility of high school mathematics departments, whereas research results demonstrate that vocational education and science could be important vehicles for teaching mathematics. Although the empirical findings of this study pertain only to the development of mathematics skills, it is plausible that the more general principle is also true, namely that academic skills such as problem-solving can be learned in an applied context, outside of mathematics courses. Such reforms will undoubtedly prove more difficult to design and implement than simply changing high school graduation requirements. However, given the fact that minimum graduation requirements in mathematics have not risen above two courses in the majority of states, it would be prudent to broaden the arsenal of policy tools used to stimulate growth in academic competencies among high school students.

* Meyer, Robert. "Applied Versus Traditional Mathematics: New Econometric Models of the Contribution of High School Courses to Mathematics Proficiency." Madison, Wisconsin: University of Wisconsin, Institute for Research on Poverty; Discussion Paper No. 966-92, March 1992.

Any comments? Write to: AWM Education Committee, c/o Sally I. Lipsey, Chair, 70 E. 10th Street, #3A, New York, NY 10003-5102

MSEB SABBATICAL VISITS

The Mathematical Sciences Education Board invites inquiries from mathematicians and mathematics educators planning sabbatical leaves who may consider work on an MSEB project either at the MSEB office in Washington, DC or from their home base. The MSEB staff works on a variety of projects in K-12 and undergraduate mathematics as authorized by the Board. Many of these would be suitable and interesting for sabbatical leaves. Limited financial support may be available for some projects. More formal "rotator" positions are also available from time to time. We are especially interested in inquiries from women, minorities, and others from traditionally underrepresented groups. Inquiries should be addressed to Lynn Arthur Steen, Executive Director, MSEB, 2101 Constitution Avenue, NW, HA476, Washington, DC 20418, email: lsteen@nas.edu.

MAA IN NJ OVERWHELMED BY WOMEN

The proportion of women speakers at recent meetings of the MAA's New Jersey Section has jumped to 50%, thanks to an all-woman program at the meeting on November 14 held at Drew University. Since Fall 1990, 13 of the 26 invited presentations at MAA-NJ meetings have been given by women, including two of the five student speakers.

The fall program featured five impressive talks on a wide range of subjects: Fern Hunt (National Institute of Standards and Technology and Howard University) on "Strange Shapes and Unpredictable Events," Fan R. K. Chung (Harvard University and Bellcore) on "The Mathematics of Buckyballs," Doris Schattschneider (Moravian College) on "M. C. Escher as a Mathematican," Cathleen S. Morawetz (Courant Institute of Mathematical Sciences, New York University) on "Airplane Flight and its Connection to Mathematics," and Thea Pignataro (City College of the City University of New York) on "Dynamical Systems, Hyperbolic Geometry, and Number Theory."

The audience was treated to an unexpected display of the interconnection between different branches of mathematics. The words "symmetry," "entropy," "hyperbolic plane," "low order approximation," and "model" appeared in different contexts, as well as the more familiar "group" and "transformation." The speakers insisted that they hadn't coordinated their talks, but Pignataro's prepared slides referred to something from each of the other four presentations. Hunt called the program unusually rich, where even the experts could find something new.

Women colleagues were featured in another way at the meeting: a copy of *Careers that Count* was included in everyone's meeting folder, thanks to AWM.

The program drew over 200 registrants to the section meeting, the largest in recent memory. Perhaps a quarter of those attending were undergraduates, with large contingents from Drew, where the student members of "Abacus" provided behind-the-scenes support for host David Housman, and from schools whose faculty provided transportation.

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by Ann Stehney, IDA Center for Communications Research, Public Information Officer for MAA-NJ

A number of attendees were heard asking if it was deliberate that only women appeared on the program. Theresa Michnowicz (Jersey City State College), the Vice-Chair for Speakers who arranged the program, isn't saying, but she has shown that accomplished women (with reputations for speaking well too) aren't hard to find. One wonders if the same people would have remarked on an all-male program.

PROMYS

The Program in Mathematics for Young Scientists (PROMYS) will be held at Boston University, June 27 to August 7, 1993. PROMYS offers a lively mathematical environment in which ambitious high school students explore the creative world of mathematics. Through their intensive efforts to solve a large assortment of unusually challenging problems in number theory, the participants practice the art of mathematical discovery — numerical exploration, formulation and critique of conjectures, and techniques of proof and generalization. More experienced participants may also study abstract algebra, combinatorics and modern geometry. Problem sets are accompanied by daily lectures given by research mathematicians with extensive experience in Professor Arnold Ross's long-standing Summer Mathematics Program at Ohio State University. In addition, a highly competent staff of 18 college-aged counselors lives in the dormitories and is always available to discuss mathematics with students. Each participant belongs to a problem-solving group which meets with a professional mathematician three times per week. Special lectures by outside speakers offer a broad view of mathematics and its role in the sciences.

PROMYS is a residential program designed for 60 ambitious high schools students entering grades 10 through 12. Admission decisions will be based on the following criteria: applicants' solutions to a set of challenging problems included with the application packet; teacher recommendations; high school transcripts; and student essays explaining their interest in the program.

The estimated cost to participants is about $1,246 for room and board. Books may cost an additional $100. Financial aid is available.

PROMYS is dedicated to the principle that no student will be unable to attend because of financial need.

PROMYS is directed by Professor Glenn Stevens. Application materials can be obtained by writing to PROMYS, Department of Mathematics, Boston University, 111 Cummingham St., Boston, MA 02215 or by calling (617) 353-2563. Applications will be accepted March 1 – June 1, 1993.

Women and minority students are encouraged to apply.

GRADUATE PROGRAMS IN MATHEMATICS

During this past academic year, women faculty and graduate students from the New York area and their invited speakers met once a month at an NSF-sponsored colloquium led by Julia Mueller (NSF Visiting Professorship for Women awardee 1991) at Columbia University. Discussions centered on mathematical and professional topics of interest to the participants, including among them conversations on characteristics of the graduate programs familiar to the women involved. As the year progressed, a number of interesting impressions emerged which provided some evaluation of those aspects of the participants' graduate educations which were invaluable and of those which were counter-productive or, in some cases, even destructive. The perceived problems almost certainly affect both men and women in their graduate careers but may affect women disproportionately. The suggested remedies could make the graduate experience a uniformly better one for any student.

Of course, this subject is a timely one. Our own discussions took place as the NRC-sponsored Committee on Doctoral and Postdoctoral Study in the United States completed its report which, among other things, characterized "successful" graduate and post-graduate programs. Such programs are described as those which:

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1) prepare students well for careers in teaching, government laboratories, business, and industry, as well as in academic research, and 2) attract larger percentages of domestic students, and in particular, women and underrepresented minorities, to study and careers in the mathematical sciences.

Many of the conclusions and suggestions which evolved through our own conversations can be found already described in detailed and persuasive form in that report. However, we feel we should list our own set of recommendations for the departments represented in the seminar, both to reinforce on a local level the general conclusions of the larger study and to provide additional specificity on particular points. To fulfill these recommendations, graduate faculty will need to interact more closely with first- and second-year graduate students than they have typically done. However, time so spent should bring its own obvious rewards and should be regarded by a department as a valuable activity.

Recommendations

I. Assign small groups of students to faculty advisors.

In our discussions of graduate work, questions were raised about why students are given so little guidance when they first arrive to begin their work. Given our current environment, the students who are most outgoing, who will get for themselves what they need, are most likely to succeed, while the shyer, more unsure among them may encounter difficulties. A single faculty member who takes a real responsibility for and interest in a small number of advisees could help create an atmosphere which signals to students the department's desire to see each of them do well. Such an advisor could helpfully intervene in several critical ways. For example, he or she could:

a) be attuned to any background deficiencies which might contribute to unusual difficulties in meeting the particular demands of a program,

b) respond to any problems with course work or examinations by discussing with the student his or her best learning style to see what steps, if any, might be taken to ensure success,

c) assist students in forming study groups,

d) when possible, pair students farther along in their work with new or less advanced ones in "junior mentoring" situations.

The last two suggestions can be especially helpful and can foster a spirit of cooperation rather than competition among students of all ranks. They also promote a sense of the profession which is rooted in reality. Mathematics and productive mathematicians, in general, benefit from conversations with others working on similar problems. Those students who regard their mathematics as only a solitary activity deny its interactive nature; in fact, working and learning within a small group can be particularly valuable for young mathematicians at the beginnings of their careers. Furthermore, by encouraging students to work together more closely, a department might prevent some students from drifting off into the isolation of their rooms where they are no longer part of a general conversation. Such independence can work wonderfully for some students, of course — especially for those who are more mature — but it sometimes conceals a student's worry or sense of failure to "compete" successfully. When the second situation is the case, a more involved attitude on the part of an advisor might turn a painful experience into a valuable one and keep young people with good mathematical potential in the mathematical sciences.

Since entering classes in most graduate programs are relatively small, such an advising effort would probably involve three or four faculty per year. Each could guide his or her advisees for the first two years of their work, at which time most students begin their research toward a thesis topic. Junior faculty might be particularly good in such an advisory role.

II. Make first-year courses preparatory to the qualifying examinations.

Students in some graduate programs are baffled by the fact that they have done well and continue to do well in their classes but find one or more qualifying exams difficult to pass. To provide our students with an integrated introduction to graduate mathematics, it is important to narrow the perceived gap, when it exists, between course work and the comprehensive examination and to create a more reasonable balance in assigning importance to each. There is no reason that introductory graduate work cannot be part of a student's preparation for the qualifying examination. However, to serve this purpose faculty should:

a) use careful evaluation and thoughtful commentary to provide realistic feedback on a student's understanding of material and writing abilities,

b) encourage students to make oral presentations to each other of course topics and so to organize ideas and test their own understandings on a more frequent and less formal basis,

c) structure beginning courses to include graded homeworks and written mid-term and final exams.

III. Expand the evaluation criteria to provide students with a wider range of opportunities through which they can demonstrate mathematical ability.

On the subject of evaluation, we found a clear consensus not only on the necessity, but even the benefit, of the comprehensive examination process. However, there was also a widely held impression that, prior to the thesis, too much emphasis is placed by departments on one or two examinations alone as instruments to evaluate mathematical potentials. Suggestions for additional criteria included:

a) use of the quality of a student's course work itself as a part of the evaluation process,

b) accomplishment of a small individual research project and successful completion of a series of small oral presentations on restricted topics.

A student's ability to pass a qualifying examination is not a definitive measure of his or her future mathematical success. In particular, failure on a first effort should certainly not be regarded as that. A small, contained research project or an additional oral examination given in supportive circumstances could provide valuable information on a student's real progress. We understand the necessity of distributing fellowship money — already in short supply — in the most efficient fashion, and do not argue with the reasonableness of a timetable for accomplishment of goals beyond which a student should not be supported. Should fellowship money be discontinued, a department might help the student find alternate means of financial support

through teaching at the home institution or at some other nearby school. However, withdrawal of financial support should not necessarily require the concomitant withdrawal of encouragement or faith in a student's ultimate ability to succeed, something we see happen far too often and sometimes with damaging effects.

IV. Under special circumstances, give students an option to defer the comprehensive examination for a reasonable amount of time — a semester, for example.

Students who request a reasonable deferment for sufficient cause should be granted this additional time. Of course, such sufficiency would need to be determined on a case-by-case basis, and the granting of a deferment would depend on a wise and fair judgment by appropriate faculty of the individual's situation. However, some occasional flexibility could be particularly important for those students who arrive with background deficiencies to overcome or who encounter unexpected difficulties during their first year of graduate work. Since today's American graduate students are generally less well prepared than their foreign counterparts, some additional time, assistance, and support could be valuable in maintaining and nurturing our own domestic talent, both male and female. Most of us can cite examples to show that holding students to a fixed schedule for passing qualifying examinations yields little true information on future research or teaching abilities and, in fact, sometimes drives talented but more slowly maturing students out of the profession.

Several added perspectives give a realistic sense of the complexities involved in creating and sustaining a rigorous yet humane graduate program in mathematics. Members of the Mathematics Department at Columbia University expressed some views which, we believe, are representative of many faculty and merit consideration:

i) that when they invite students to discuss any problems they might face, few ever respond,

ii) that the present job situation is so dismal at the college and university level that encouraging mathematics students would be a disservice to them and to the mathematics community which is so strapped for time and resources in educating the next generation,

iii) that in some universities students are socialized around their mathematical studies, develop peer mentorships and collaborative working habits, and generally feel comfortable in their learning environment, while in other places there is severe competition not only for academic survival and fellowship support, but for a desirable thesis advisor. One person described such a department as one where many students are extremely anxious and feel themselves continuously under an enormous amount of stress.

We infer from these conversations and other recent work that creating a healthy learning environment entails a change of culture which even well-intentioned senior faculty cannot easily bring about. We are encouraged by their awareness of the potential role they might play in this acculturation. The following quote from an article by Walter E. Massey [*Science*, November 13, 1992, pp. 1177–1179] speaks to our recommendation for enlarging our pool of competent graduate students:

> ...Often "success in science" connotes the careers of those rare individuals who blaze a trail across the firmament of our profession like hot comets in our skies, whose unique insights open entire new areas of thought, discovery, and innovation. Just as crucial, however, is the everyday success achieved by the cadre of scientists and engineers who continuously clarify our understanding of phenomena, improve our technologies, and teach the next generation....

> Moreover, it is not even evident that the "best and brightest" flourish in the current environment. Students sharpening their academic predatory skills and demonstrating their grade-getting abilities have little time to contemplate science, to question and examine what they are learning. And they have little incentive to cultivate the interpersonal skills, the esprit de corps, that characterize most modern research and technological endeavors....

BOOK REVIEW

A long overdue review of Sandra Harding's **Whose Science? Whose Knowledge?**

A couple of years ago I promised Cathy Kessel a review of Sandra Harding's *Whose Science? Whose Knowledge?* I meant well, I really did. I took that book to conferences, on vacations — I even read it at the beach! But somehow I just couldn't seem to finish it. Maybe it was passages like:

> The issue for the feminist epistemological critiques is a different one: "woman the knower" (like "woman scientist") appears to be a contradiction in terms. By "woman the knower" I mean women as agents of knowledge, as actors on the stage of history, as humans whose lives provide a grounding for knowledge claims that are different from and in some respects preferable to knowledge claims grounded in the lives of men in dominant groups.

Readers of Harding's earlier work will notice a slight improvement: in her early book *The Science Question in Feminism* she just plain flat out said that "woman scientist" was a contradiction in terms; now it merely appears to be one. But a more serious problem is that this book is nearly impossible to read. I quit for about six months after reading three unreadable (yes, one can read the unreadable) pages in which she grapples with definitions of "lesbian" only to conclude "I shall count as lesbian all those women who have adopted the term for themselves." Thank God she didn't try to grapple with more sociologically complex concepts, like "middle-class."

Harding's style is marked by murkiness, by a propensity for definitions which don't really define anything, and by a constant going back on what you thought she was saying by complicated qualifiers. She always seems to be looking over her shoulder to see if she's offended any allies. Furthermore, much of the book reads like a rapid survey of the literature, or, even worse, it reads like quick potshots at authors who are identified by name but little else, so that the reader not a specialist in feminist epistemology doesn't even know what Harding is talking about. If this were a technical article in a

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journal for specialists these problems would not be as serious — as with any technical writing, her colleagues would be able to figure out what she meant to say from what she actually did say. But this book is clearly meant for a wider audience, an audiences which includes both feminists and scientists. As such, it fails. Rayna Rapp's review that appeared in the November-December 1992 AWM *Newsletter* (reprinted from *Science*) spoke of "logical argument" and used the adjective "gracefully." I'm sorry to say that I saw precious little logical argument, although there were a lot of assertions, and absolutely no grace. And this is unfortunate, because the issues Harding raises are serious ones. Outside of biology, the scientific community (including mathematics) has very little knowledge of these issues, and those of us who are aware of them generally don't know how to approach them.

We begin with the question of whether science and mathematics are objective, and if so, just what "objective" means. Do they have epistemological claims that are more riveting than other methods of inquiry? This issue is pretty old and fairly well understood by philosophers, and even by a good number of scientists and mathematicians.

Once you grant that science and mathematics are not and cannot be "objective" in the way you thought they were in, say, third grade, you might want to ask yourself what the subjectivities are. The issue Harding raises is this:

> Science and mathematics as we know them have, for the last several centuries, been dominated by men of European ancestry. Metaphors used in scientific description and scientific public relations are often sexually charged.[1]

> 1. What has that done to science?

> 2. How can we bring in the views that have been silenced,[2] those of women, non-whites, non-heterosexuals?

> 3. And if we do does our definition of science (and mathematics) change?

Most readers of this *Newsletter* are what Harding calls "femininist empiricists." Our answers to the three questions above would, roughly and simplistically, be:

> 1. Perpetuated the old boy network.

> 2. Give encouragement from an early age, and financial and emotional support.

3. No.

We are scientists and mathematicians, and most of us believe that in the deepest sense science and mathematics are on the right track, even though we take issue with some of their more superficial manifestations.

But Harding is a standpoint theorist, which means that she thinks a person's world-view is colored so deeply by their "standpoint" — gender, sexual orientation, ethnic identity, economic situation, social class, etc. — that, in effect, people from different standpoints live in different worlds, that we not only see things differently but see different things. On some level this is a truism, but that is not the level at which Harding wishes to speak. She speaks of "transformed logic," although she doesn't really say what this means. She calls physics and chemistry "folk science" (of white male folk).

> The "oddity" of a lack of intentionality in much of the natural world, however, does not exempt the natural sciences from the directives of critical social science to examine the constraints and resources placed on belief formation by different historically located social relations.

Yes, as Rapp's review said, she holds up the social sciences as the model for the physical sciences. How dare she!

Well, why not? Readers of the AMS *Notices* may recall the articles in the November 1992 issue on the question of what, exactly, is a proof, and may recall that this question came up because of a lawsuit about a very real issue: could a particular computer program be trusted? And they might recall Keith Devlin's very witty dialogue in this issue in which a run-of-the-mill professor tried to explain to a bright but obstreperous student just what a proof was, only to get tied up in knots. Do you know what the epistemological justification for your work is? Not many of us do. The challenge Harding makes to conventional science is not as weird as it seems.

The stance she wants us to take seems somewhat akin to that of a cultural anthropologist: the realization of the inherently arbitrary nature of all human activity, and the humility and openness that this brings. Like the reviewer in *Science*, I find this an exciting prospect, although I have no idea how to carry it out.

But neither does Harding. Harding gives no indication of understanding science on any level other than the superficial journalistic one. She seems to work not from primary or even secondary sources, but from tertiary sources and beyond. When she describes something specific in science, it tends to be on the level of pointing out that the old heart disease studies didn't include women. Compare this with, say, Thomas Kuhn meticulously re-living (or reinventing?) 18th century chemistry. Harding wants to — indeed must — include physical sciences and mathematics in her program for it to have the epistemological weight she claims; she does not want to be a simple sociological reformer. But she gives no indication of knowing what physical science and mathematics are; like Ezra Pound writing about Chinese, she simply does not know what she is talking about.

The feminist critique of science is raising epistemological issues which are worth raising. But they cannot be dealt with unless practicing scientists and mathematicians join in the dialogue. And that is the true challenge of Harding's book.

Notes

1. The chapter on Bacon in Evelyn Fox Keller's *Reflections on Gender and Science* does a good job on this.

2. Harding would say that in doing science a woman, or non-white, or non-heterosexual must stifle her or his own insight coming from outsider status or, at the very least, modify it to be acceptable to the majority.

A NEW EMAIL LIST

Feminism in/and Science and Technology, FIST@hamp.hampshire.edu, is a new unmoderated email list. The idea is to discuss critiques of science and move beyond these critiques into the realm of: How do we create a feminist science? What do we need to pay attention to? How does one do this and get tenure? How do we teach science?

To get on the list, send a message to FIST-request@hamp.hampshire.edu (please be patient). *Please include a paragraph introducing yourself and what you do.* To send a message to the whole list, write FIST@hamp.hampshire.edu.

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MATHEMATICS EDUCATION AND FEELINGS

1. The Nature of Mathematics

Its characteristics

Some people love math; others hate it. Why does mathematics provoke this polarization? In all fairness, math is a difficult subject for most people. It demands abstract and formalized thought on the one hand and creativity and intuition on the other. It is replete with formulas, a classic cause of math anxiety, but formulas are a good way to express possibly complicated relations. Perhaps it is the compression of information in formulas that has a prohibitive effect on some people. Moreover, the abstract requirements of the subject include deep concentration and a sense of material reality.

Doing mathematics is cognition and problem solving. Its mastery gives a deep satisfaction, and repeated lack of mastery gives just as deep a frustration.

Its uses and pleasures

What are the pleasures and use of mathematics? and of the closely allied computer science? Both have these four functions:

1. ordinary usage, like doing taxes;

2. critical analysis for citizens, in economics and statistics and, more generally, in mathematical and computer models;

3. professional uses, in one's education or work such as engineering;

4. the creation of pleasurable games and pursuits, exemplified by Rubik's cube, chess, crossword puzzles, work with PC's, computer games, and even some forms of music and art.

In the aesthetic and creative aspects of mathematics we are reminded of music and art. There is an interesting letter by Sofya Kovalevskaya (1850–1891) written in 1890 and quoted in part in [Kovalevskaya, Sofya, 1978, p. 35]:

> ... you are surprised at my working simultaneously in literature and mathematics. Many people

by Else Høyrup, Roskilde University Library, Denmark
translated by Lars Kadison, Roskilde University Center,
Denmark, in collaboration with the author

who have never had occasion to learn what mathematics is confuse it with arithmetic and consider it a dry and arid science. In actual fact it is the science which demands the utmost imagination. One of the foremost mathematicians of our century says very justly that it is impossible to be a mathematician without also being a poet in spirit. It goes without saying that to understand the truth of this statement one must repudiate the old prejudice by which poets are supposed to fabricate what does not exist, and that imagination is the same as "making things up." It seems to me that the poet must see what others do not see, must see more deeply than other people. And the mathematician must do the same.

I think the pleasures of doing pure math or computer science stimulate their application, and vice versa. Both belong to a good education in math — even to the education of professional mathematicians.

Its human face

Mathematics is considered by some people as a cold subject with neutered practitioners. They feel a wholesomeness missing from it. Moreover their memories of a math class are of points being subtracted rather than awarded.

It is crucial for a good education in any discipline that the students receive some human attention, that the joys and sorrows of ordinary life get recognized.

Technology assessment

An important component of assessing technology is a certain grasp of the mathematics, computer software and other technicalities that go into it, especially in these times of almost uncritical expansion. However, one need not be an expert. It is important that women get involved in the public debate about new technologies, as technological development will affect them as much as men. It is rather sad that far greater numbers of women than men are reluctant to take up an interest in technology. But when they do, we must listen to their criticism.

Pure or applied mathematics

In the tug of war between pure and applied math, education in the 60's tended to emphasize pure math too much, while the 70's and 80's saw some institutions going to extremes in demanding the applicability of mathematics. The future will

hopefully hold equal space for both. Applied math is also very demanding because its mastery requires real insight and engagement in the area of application.

2. The joys and setbacks of mathematics

Feelings

How do we find joy in doing mathematics? Although math is often an obligatory course in school, it is quite necessary to communicate math positively: teach more playfully and in a manner less bound by duty.

The negative feelings that many people experience doing math sometimes develop into a "mathophobia" or "math anxiety" [Tobias, Sheila, 1978, 1987, 1990; Mallow, Jeffrey V., 1986].

I think that in all stages of math problem solving one should play at it a little. Even the trial-and-error spirit of doing jigsaw puzzles will work to solve lots of math problems and establish confidence.

Computers

Computers are a commercial product, so playing with them or with electronic games is somehow more acceptable than to play with pure mathematics. We also see that play in math and computers stimulates application, and vice versa.

Mathophobia

Negative feelings toward math can be due to psychological factors or sociological factors such as stress in the home or social problems. Teachers should try to view their students as whole people and set a good example themselves. The teacher will ideally understand the student's social situation.

When the students feel they cannot figure out their math or computer homework, they will progress from discomfort to anxiety and powerlessness. Any hope of reversing this process depends on the teacher's handling of the students. In a parental way the students could be led into a good experience that would build their self-confidence.

Content or awareness

Mathematics and physics teachers often press a scientific point home to the audience at the expense of eye contact or audience engagement. People get to feel that these subjects are in stark contrast to the humanities. It is especially girls and women who

are scared away because their human needs and interests are unfulfilled.

Jan Carlzon

Mathematics is often presented in an awkward way that discourages input from students and employs rigid grading of the student's efforts. This problem can also occur between management and workers in a corporation. Jan Carlzon, the president of the airline company S.A.S., has written about the futility of traditional management structures in *Tear Down the Pyramids* [Carlzon, Jan, 1986, pp. 145-148]. He writes that top management should allow for mistakes among employees, thus paving the way for more creativity. Conversely, if management only issues reprimands, employees quickly adopt a disengaged attitude.

Rationality and feelings

Mathematics is a rational discipline, yet it awakens strong feelings as noted. Even in the classroom the interaction between math teacher and students will be subject to feelings. Also the application of math and computers to defense is dominated by the feeling of insecurity. Let's look more closely at rationality and feelings.

Rationality has its positive uses like administration and its negative uses like Cold War defense planning. Feelings can be positive like joy and love, or negative like anxiety and hate.

I would like to see mathematics education and technology assessment combining rationality with feelings in a positive way. It would be wrong to set up barriers between rationality and feelings. Humanity consists of both parts.

Love and hate

Turning back to the love-hate relation to mathematics, we discern different types of people:

1. those who love math

2. those who hate math

2a. among those who hate math, the ones who would have been good at it

2b. among those who hate math, the ones who just cannot do math

2aa. among those who would have been good at math, the ones who would have benefitted from learning it

2ab. among those who would have been good, the ones who will rarely have any need of math.

In the traditional schooling of Scandinavia, students were sorted into categories 1 and 2 through a combination of choice and examination. The group 2aa would benefit greatly, as would society, from a more prolonged education in math that took their special needs into account [Tobias, Sheila, 1990].

3. Math and gender roles

Let's turn now to look more closely at gender roles in math education. Women predominate among the groups 2, 2a, and 2aa. According to Danish teachers, they don't lack the ability to do math. As far as I (a former math teacher myself) can see, they simply are not that interested in math. Let us look closer at this problem, lack of interest.

Getting women to choose "men's careers"

The Danish Ministry of Education, the Danish Employer's Union and women's organizations now for some years have agreed upon the desirability of getting more women interested in traditionally male careers: the so-called "re-direction campaign." The underlying concern is in fine-tuning employment opportunities for young people, who until recently have met with unemployment in traditional "female subjects" (like nursing and teaching) and almost full employment in the "male subjects" (like engineering and trade). Mathematics is of course included as a traditionally male subject, and indeed is an important component of several of the other male subjects.

The re-direction campaign is fine, but it misses two points:

1. It is a mistake just to change women so they are better adapted to the present state of the technical subjects. The conditions in the technical subjects should also give way a little to suit women better. And maybe more women in the male subjects would change these subjects in a desirable way (like environmental concern and peace in the world).

2. It is desirable that women work with mathematics, natural science or technology not just for reasons of employment, but also for these subjects' intrinsic interest and their importance to our modern information society.

Women today want more than the low-skilled or poorly paid jobs; more and more want to strive for good well-paid jobs. Admittedly, the first female pioneers in male subjects had better be among the best, for think of the odds against their success otherwise.

Playing down talent

Both in adolescence and later in marriage, men easily get jealous of intellectual success in women, especially when it is in math, physics, and other male bastions. It is other "feminine traits" men prefer in women: to stand out intellectually is generally not recognized as feminine. Girls learn this early on, and it leads to their playing down their talents. Much has been written about women's "fear of success" [Horner, Matina S., 1972], of which intellectual success is a significant part.

Even though more women are at work than ever, and some have gone into careers that use math, the old gender roles persist deep within us all and explain much of this sociology.

Power and control with computers

It has been shown that a difference exists in men's and women's attitudes towards computers [Turkle, Sherry, 1984]. Boys are more eager than girls to play with computers, and girls are more critical of computer use. Let's have a look at possible reasons behind this.

It is almost certainly a question of the different total relation of men and women to computers. Computers involve aspects of power and control even more so than math. Power and control are just more appealing to boys than to girls; girls regard these as the negative side of emotional life. Take for example the many electronic war games, an especially big hit among boys. Most girls are just more interested in social life and family nurture, which represents to them the positive things like love and friendship in emotional life. But of course computers don't have to orchestrate wars; they could like pure math be used to play, which would make computers more appealing to girls.

Computers also affect the sexes differently on the job, as in the office place which more and more is subjected to automation. Men holding the top positions want to "rationalize" and "economize" by use of computers. Women in the lower-rung positions fear a worsening of work conditions or getting laid off.

But of course women also enjoy some of the computer applications, such as electronic information retrieval in the libraries and word-processing in the office. Modern word-processing and desktop publishing have aesthetic and creative sides, which appeal to women's interests in those areas.

The rationality of utility vs. the nurturing rationality

I would like to conclude by pointing out traditional divisions between men and women:

1. Men often look at things with a view to their function and economic utility.

2. Women often proceed with intuition about humanity and apply a rationality of nurture gained through being wives and mothers.

Even though this division is "averaged" the effect is felt today and is unfortunate. We must loosen the boundaries of this division, not just for our own sake (towards becoming whole again), but also from the point of view of children and students, young and old. Children and students benefit from meeting men good at 2) and women good at 1).

One should attempt to mix traditional sex roles — though without going overboard — because both the rationality of utility (*including math*) and the rationality of nurture lead to much good when combined. Indeed we must widen the rationality of nurture to encompass environmental concerns.

What do we really mean by rationality? A "limited rationality" might mean that working conditions and environmental concerns mean nothing compared to maximizing profits. An "extended rationality" might mean an extended model in which humans and nature get included.

Men until now have felt antagonistic forces at work between home and society, but for working women today the feeling is more that home and society are two related things. Women today probably hold more holistic views than men, views that would really help both men and women.

To summarize my thoughts about women, math, and society:

Society needs women,
Women need math.

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DUES: If you have not yet received a dues notice, please let us know. Either we need to correct the database, or the notice is lost in the mail.

SCHOOL COUNSELORS

For several years now, many of us have viewed counselors at junior high and high school levels as key people for encouraging young people to take math/science courses. We have also invited counselors to several different events — with very minimal success.

At a meeting, I cornered a computer science teacher who had previously served as a high school counselor at lunch one day and told him of our concerns and very directly asked, "What in the devil is going on." I appreciate his candor, shared below and subsequently validated by others in the system:

a) The primary mission of the counselors in today's schools is to manage the school's public image. (That one surprised me a lot!)

Schools are under mandate to reduce the drop-out/failure rate and to graduate a higher percentage of students. Counselors are given the task of making that happen, and they do it by assigning students to lower-level courses so the greatest number will be sure to pass/graduate.

Thus, when counselors tell students that math/science courses are "too hard," they are basing their advice on the school's objectives, not on the students' potential.

Schools hope to "look good" in the media when their average SAT scores are published. In order to have high scores, counselors are administering the SAT tests to top students (a very small percentage).

b) Counselors are available to attend meetings during the school week that include lunch and that are scheduled between 11 a.m. and 2 p.m.

I was told that counselors can go to lunch (free) at least three times weekly. Luncheons are regularly scheduled by places that seek to buy the business of counselors in terms of referring their emotionally disturbed students to those facilities.

A principal will usually agree to send only one counselor to each luncheon meeting. The others will be held on campus to handle any crisis that may arise (I assume that means real as well as image). The one who is selected to go will be responsible for bringing the message back to all others.

It was recommended to me that if we sought to have a meeting for counselors that we prominently display the university name (or perhaps even that of the state education association). Principals are motivated in such decisions by status.

I think we will need to think long and clearly about ways to counteract the counselor's mission if we hope to have a greater involvement of students in math/science. We're looking at a major social change that involves — beyond basic honesty (issues of ethics) — also a different belief structure, value system, and rewards. Off the top of my head, I assume we'll need to involve heavily business/industry, to reward good works vs. good looks, and to threaten withdrawal of funds relative to fraud/deception, also to alert parents who have a vested interest in their own children.

NOTE: These comments came my way second-hand via email. The author agreed to have them published, but wishes to remain anonymous. All references to her state have been removed.

THE SOFYA KOVALEVSKAYA MUSEUM

A memorial museum for Sofya Kovalevskaya is being created at the Polibino settlement, near the town of Velikiye Luki, in the Pskov region of northwestern Russia. It was here that Kovalevskaya spent her years as a child, described later in her famous *Childhood Memories*, first published in Sweden in 1889 as *The Raevsky Sisters*.

The main house and wing of the Korvin-Krukovsky country estate are still standing, surrounded by the park, with trees up to two hundred years old. The estate also includes a beautiful lake.

A decision to restore the Polibino estate and to set up a memorial museum here for S. Kovalevskaya was taken in 1983 by the Russian Ministry of Culture.

Museum officials began their research in the archives at Moscow, Leningrad, Minsk and Velikiye Luki. Their main task was to find the original

plans of the estate and to recreate the history of that country house, while assembling documentary and other items that might be used as museum exhibits. A number of important papers and personal possessions belonging to Kovalevskaya and her closest relatives and friends were acquired. The scientific content of the museum will be based on archival material and on Kovalevskaya's private papers.

The memorial complex in Polibino will consist of a two-story house with a three-story tower, a large wing, a park (where Kovalevskaya's parents were buried), and the lake, covering an area of thirty-six hectares in all.

The house and wing need considerable renovation. During the period of postwar reconstruction, the internal structure of the house was altered, leaving the museum staff to solve the difficult but very interesting problem of restoring the house to its condition in the decade 1850-60. By 1987, a reconstruction program was formulated, involving the restoration of a marble staircase, a wooden spiral staircase, balconies and terraces, all of which had been either lost or destroyed.

There is a great deal of work to be done in the park. Many alleys and paths are being restored. Extensive planting (over a thousand trees and ten thousand shrubs) is envisaged. In addition to work on the house and wing, it is intended to rebuild certain other structures that have been lost: the chapel where Kovalevskaya's parents were buried, pavilions, bathing huts, greenhouses and a distillery.

The restoration is planned to take places in two stages, and it is hoped to complete the museum complex by the year 2000, when we celebrate the 150th anniversary of Kovalevskaya's birth.

The museum will be the only one in Russia, and probably in the world, dedicated to Kovalevskaya. It is intended to be a storehouse of memorial relics and to serve also as a center for the promotion of women's rights in science and in life generally. The museum aims to provide a picture of Kovalevskaya's life and to explain the significance of her scientific and public work. While much of the material on display will be devoted to the Polibino period of Kovalevskaya's life, there will be an extensive exhibition covering her life in Germany and Sweden where her scientific career began. An important subsidiary aim of the museum is to recreate the way of life of a provincial Russian estate of the mid-nineteenth century.

We want to spread information about Kovalevskaya's life and work throughout the world. We are in touch with the Kovalevskaya foundation in the U.S.A., which is headed by [Dr.] Koblitz, and hope to learn more of its activity. We are also in touch with Kaiserslautern University, which has established an exchange-professor scheme in Kovalevskaya's name, beginning this year. The exhibition will include an account of this scheme's operation.

We are grateful to the Swedish Mittag-Leffler Mathematics Institute for allowing us to study the Kovalevskaya archive and to copy material for our museum. We continue to collect memorial relics and documents relating to Kovalevskaya, and seek knowledge of Kovalevskaya's relatives, wherever they may be. If you have any information about Kovalevskaya, her life or her work, please write to: Director Valentina Rumyantseva, Polibino, Velikiye Luki District, Pskov Region 182157, RUSSIA.

CONFERENCES

Regional Geometry Institute and special women's program with MSRI

Pending funding, a Summer Geometry Institute sponsored by the National Science Foundation will be held in Park City, Utah, from Sunday, June 20, through Saturday, July 17, 1993. The Institute incorporates learning, teaching and research activities and interactions in geometry for high school geometry teachers, undergraduate math majors, graduate students, and university teachers and researchers. High school teachers, in partnership with university mathematicians and students, will explore the evolution of classical geometry to modern geometry on curved spaces and will discuss issues of geometry education at all levels. Undergraduates and graduate students will be offered an intense yet accessible introduction to areas of geometry research and application by nationally and internationally respected leaders in algebraic geometry and related fields. The Research and Graduate Summer School topic for the 1993 Summer Institute is "Higher Dimensional Complex Geometry." A full range of computer activities and problems in classical geometry and elementary algebraic geometry will be explored by the various participants.

Also pending funding, a highlight of the 1993 Summer Institute will be a special joint program with the Mathematical Sciences Research Institute

(MSRI) in Berkeley, California, for undergraduate and graduate student women. The program is specifically designed to invite talented young women to consider a career in pure mathematics in general and in the area of algebraic geometry in particular. Women students admitted to the Summer Geometry Institute in Park City will also be invited to attend a special two-week program at MSRI in May 1993. There they will be offered a program of an introduction to algebraic geometry and participation in small working groups with individual mentoring, organized especially for them by participants of the Special Year in Algebraic Geometry at MSRI. Mentors from this program will then accompany the group to the Summer Institute in Park City in June and July to continue their support activities.

For more information about the women's joint program with MSRI, please write to either Professor Karen Uhlenbeck (Department of Mathematics, University of Texas, Austin, TX 78712; email: uhlen@math.utexas.edu) or Professor Robert Bryant (Department of Mathematics, Duke University, Durham NC 27706; bryant@math.duke.edu). Please include your email address, mailing address, and daytime phone number.

For general information about the Summer Geometry Institute and application forms, please contact the Regional Geometry Institute, 18C de Trobriand Street, Fort Douglas, Salt Lake City, UT 84113. Phone: (801) 585-3488. Fax: (801) 585-5793. Email: rgi@math.utah.edu

The Summer Geometry Institute specifically invites applications from women and members of minority groups.

NFS-CBMS Regional Research Conferences in the Mathematical Sciences

Contingent upon NSF funding, five NSF-CBMS regional research conferences will be held between May and August of 1993. These conferences are intended to stimulate interest and activity in mathematical research. Each five-day conference features a distinguished lecturer who delivers ten lectures on a topic of important current research in one sharply focussed area of the mathematical sciences. The lecturer subsequently prepares an expository monograph based upon these lectures, which is normally published as a part of a regional conference series.

Pending funding, support for about 30 participants is provided. The conference organizer invites both established researchers and interested newcomers, including postdoctoral fellows and graduate students, to attend.

The five anticipated conferences are: "Semiparametric Mixture Models: Theory and Methods, with Applications in Empirical Bayes, Measurement Error, and Random Effects Models," Bruce G. Lindsay, lecturer, mid-May, University of South Carolina at Columbia, John M. Grego, organizer, 803-777-4651, n540006@univscvm; "Applications of the Representation Theory of Quantum Affine Lie Algebras to Solvable Lattice Models," Tetsuji Miwa, lecturer, June 1–5, North Carolina State University, Kailash C. Misra, organizer, 919-515-3320, misra@ncsuvm.cc.ncsu.edu; "Compensated Compactness, Homogenization and H-Measures," Luc C. Tartar, lecturer, June 28 – July 3, University of California at Santa Cruz, Maria E. Schonbek, organizer, 408-459-4657; "Equivariant Homotopy and Cohomology," J. Peter May, lecturer, August 2–6, University of Alaska at Fairbanks, Robert J. Piacenza, organizer, ffrjp@alaska.bitnet, 907-474-7772; and "Classification of Amenable Subfactors and Related Topics," Sorin T. Popa, lecturer, August 24–28, University of Oregon, N. Christopher Phillips, phillips@bright.uoregon.edu, 503-346-4714.

Information about an individual conference may be obtained by contacting the conference organizer. Information about the series may be obtained by writing CBMS, 1529 Eighteenth St., NW, Washington, DC 20036; 202-293-1170.

Proposals for the 1994 NSF-CBMS Regional Research Conferences in the Mathematical Sciences are requested. The closing date for applications is April 1, 1993. For a brochure giving the program description, review criteria, and information on format and submission of proposals, call or write CBMS as above.

Conference on Integration of Precalculus with Calculus, Moravian College, June 18-19, 1993

Access to calculus for students who do not have adequate preparation is an issue that every college and university has to face. The standard approach of requiring a precalculus course (or a tier of various remedial courses) for such students prior to enrolling in the first calculus course is one that has limited success. Often the majority of these students never make it beyond the remedial course. Recently several institutions have tried a new approach: a

slower-paced one-year course that covers the content of the usual first semester course in calculus while providing the necessary background and review of precalculus material as it is needed.

Moravian College in Bethlehem, Pennsylvania will host a conference on June 18–19, 1993 that will focus on several issues that surround the development of a calculus course for underprepared students. This will cap a two-year FIPSE-funded project in which faculty at Moravian College and Northampton Community College developed and class-tested materials especially designed for this course, to be used along with a standard calculus text.

The conference will feature an overview by Susan Foreman (of the Mathematical Sciences Education Board) of different initiatives by various institutions to make calculus accessible to a wide audience, an open discussion by faculty at several institutions who have developed "integrated" courses at their institutions, contributed papers, and a display of materials.

Contributed papers are invited on the following topics: courses that integrate precalculus with calculus, research in learning precalculus-calculus, teaching calculus to the underprepared student or to the nontraditional student, assessment of attitudes and mathematical understanding, and the role of technology in a precalculus-calculus course. Abstracts must be submitted for review by April 1, 1993. The registration deadline for the conference is May 15, 1993.

For further information on the conference, including registration materials, or to submit an abstract, write to: Doris Schattschneider, Department of Mathematics, 1200 Main Street, Moravian College, Bethlehem, PA 18018-6550; email: schattdo@moravian.edu.

Joint Summer Research Conferences in the Mathematical Sciences

The 1993 Joint Summer Research Conferences in the Mathematical Sciences will be held at the University of Washington, Seattle, from July 10 to August 6. It is anticipated that the series of conferences will be supported by grants from the National Science Foundation and other agencies.

The conferences are: "Curvature equations in conformal geometry," July 10–16; "Multivariable operator theory," July 10–18; "Spectral geometry," July 17–23; "Recent developments in the inverse

Galois problem," July 17-23; "Mathematics of superconductivity," July 24–30; "Distributions with fixed marginals, doubly stochastic measures, and Markov operators," July 31 – August 6; and "Applications of hypergroups and related measure algebras," July 31 – August 6.

The deadline for receipt of requests for information is March 1, 1993. For detailed descriptions of the topics of the conferences, see the November 1992 AMS *Notices*.

WOMEN IN MATHEMATICS, 1991-92

Department	Tenured		Untenured		Tenure Track/ Could Lead to Tenure	
	Total	Female	Total	Female	Total	Female
UC-Berkeley	60	2*	12	3	2	0
Caltech	13	0	6	0	1	0
Chicago	25	0	24	2	6	0
Columbia	14	1**	12	0	0	0
Harvard	17	1	14	3	1	0
MIT	40	0	38	4	12	1
Michigan	49	1	38	6	3	1
Princeton	31	0	28	7	22	5
Stanford	23	0	9	1	2	0
Yale	16	0	11	1	3	0
Total	288	5	192	27	52	7

* One has a joint appointment with UCLA.
** Tenured at Barnard

Women in math update. Last year, *Science* published a table on the number of women who have tenure or are in tenure-track positions at 10 math departments in the United States. That table caused considerable controversy, partly because of some confusion over its categories. In the interest of accuracy, we are publishing a carefully revised version of the table, updated to the 1991-1992 academic year. "Untenured" is here used to mean all full-time members of a department who do not have tenure, including both tenure-track and non-tenure-track positions. "Tenure-track," a subset of the untenured group, means members of a department with appointments at the end of which the member must automatically be considered for tenure. Columbia, Harvard, and Yale report no tenure-track appointments in this strict sense. Yale notes that "assistant professors have been promoted to tenured positions

sometimes in the past." (Yale currently has three men, but no women, in such positions). Harvard has one department member (a man) in a position it says "could lead to tenure." Princeton argues that all 22 of its instructors and assistant professors are in positions that "could lead to tenure"; of the 22, five (four instructors and one assistant professor) are women.

PROMPT

Heeding national calls for mathematics education reform, California professors will convene over the next three summers to transform the way prospective teachers are trained.

With a $1.17 million grant from the National Science Foundation, two Humboldt State University faculty members are directing the project, which accepts the challenge for change posed in "Mathematics Framework for California Public Schools, K–12," a document recently issued by the state.

Directed by Professor Phyllis Chinn and Assistant Professor Dale Oliver of Humboldt's mathematics department, the response is PROMPT, or Professors Rethinking Options in Mathematics for Preservice Teachers. Barbara Rother, a lecturer in teacher preparation at Humboldt, is the project coordinator.

According to Chinn, "There is a significant gap between the way prospective kindergarten through eighth-grade teachers are learning mathematics in their university preparation and the way they will be expected to teach mathematics under California's new 'Framework.' "

PROMPT, she said, seeks to close the gap by widely integrating the best methods of teaching children into university mathematics classes for prospective teachers.

"It is crucial that the nature of the transformation be defined collectively by the group of university professors who do the teaching, so intensive summer workshops are planned for 300 California college faculty. In turn, they will teach upwards of 9,000 prospective teachers each year," Chinn said.

Humboldt State will host the PROMPT sessions during the next three summers for, in order of appearance, faculty from the California State University (CSU) system, from other California universities offering K–8 teacher-training, and then for faculty from community colleges.

Chinn and Oliver expect PROMPT's impact to be felt throughout California and the U.S. because, according to a CSU Chancellor's Office report, more than 70 percent of California's teachers and 10 percent of the nation's are educated in the CSU.

The new "Framework," adopted this year by the California State Board of Education, calls for mathematics learning to be organized into large "investigations" that encompass many aspects of mathematics. It also calls for changes in teaching styles (for example, more facilitating than lecturing and allowing students to have manipulative tools available at all times) and for changes in the way learning is evaluated.

Oliver said, "University faculty members who teach mathematics to future K–8 teachers recognize the need to respond to the 'Framework.' They are also concerned about maintaining mathematical integrity in the face of these calls for major changes."

The PROMPT project, he said, brings together college mathematics instructors — the "missing links in the chain of mathematics education reform" — so they can share and explore options in teaching future teachers.

"The emphasis," he said, "will be on integrated learning experiences which involve several areas of mathematics organized into large ideas or applications. We want to focus on presenting a relevant context in which we're going to study mathematics."

One "context" Oliver uses is determining how much money could be saved at a grocery store if cereal were packaged differently.

"That question in itself creates a context in which a lot of math can be applied: statistics and probability of buying different sizes, the geometry of the box, measurements, and tesselation — just a fancy name for packing formations."

According to Chinn, with more focus on "integrated learning experiences" comes less emphasis on rote arithmetic drills. "With the changes in available technology, including calculators and computers, it is less important for children to be able to add, subtract, multiply and divide quickly. It's more important that students learn *when* to do these operations, and learn to estimate well."

AWM WORKSHOP

AWM will sponsor a Workshop in conjunction with the annual SIAM meeting for women graduate students and postdocs in applied mathematics. It will be similar to the workshops held at major mathematics meetings over the past three years and will be funded by NSF and ONR. The workshop will take place on July 11, 1993, before the SIAM Meeting (July 12 to 16) at the Wyndham Franklin Plaza Hotel in Philadelphia, PA.

Funding for travel and subsistence will be offered for up to ten women graduate students and ten women postdocs to attend the AWM Workshop. Those attending are encouraged to stay for the rest of the SIAM meeting. Departments are urged to provide some institutional support.

To be eligible for funding, graduate students must have begun work on a thesis problem. Postdocs must have received their Ph.D. within approximately the last five years. All applications should include a curriculum vita and a concise description of research; graduate students should include a letter of recommendation from their advisor.

Nominations by other mathematicians (accompanied by the information described above) are welcome.

The deadline for applications is April 1, 1993. They should be sent to: Jodi Beldotti, Executive Director, AWM, Box 178, Wellesley College, Wellesley, MA 02181; (617) 237-7517.

PREPARING FOR THE 21ST CENTURY

"To prepare for the 21st century, all children must be given an equal opportunity to learn; ... society must be rid of the continuing assumption that girls and minorities are not well suited to pursue mathematics and science; and qualified teachers, with an emphasis on women and minorities, must be recruited for the teaching of mathematics and science," said The Honorable John W. Olver as he opened a symposium sponsored by the Commission on Professionals in Science and Technology. He outlined some ways the Congress could help, noting that symposium participants were the ones who could truly "make a difference."

Other experts presented facts, demonstrations and ideas concerning the existing and projected supply and demand of human resources in science and technology for the year 2000 and beyond.

Betty Vetter examined tomorrow's workforce in the light of today's 13-year-olds, who know less math and less science than their contemporaries almost anywhere in the world.

Our increasing dependence on foreign scientists was analyzed by Charles Foster and Kenneth Collins. Foster provided an overview of the rules and regulations governing foreign nationals, while Collins looked at foreign nationals employed at NIH.

Industry-education partnerships were examined, while Kenneth Brown and Daryl Chubin looked at the size of the R&D pie.

The scientific and technological workforce in a global marketplace was viewed from several perspectives. John Lyons provided an American view, Wendy Hansen looked at the scene from Canada, Sheldon Weinig examined a global company (SONY), and Gilbert Fayl spoke from Europe.

Thomas Ratchford gave an overview of the Human Resources issues and discussed activities underway at the Office of Science and Technology Policy. A panel of human resource experts from industry looked at new realities of industrial employment, from downsizing to outsourcing to cultural diversity.

The picture in higher education included a demonstration of exciting and innovative teaching methods for science by Zafra Lerman of Chicago's Columbia College and Sylvia Ware of the American Chemical Society. Edward Connors examined the adequacy of the current educational system to meet occupational goals, and AAUP President Barbara Bergman outlined options for renewing the academic roster.

Daniel Greenberg gave a delightfully irreverent insight into science policy in the Bush administration, while Janet Halliwell from Canada's Science Council wondered "How Many Are Enough?" An outstanding synthesis of the two-day affair was provided by Richard Wilcox.

Preparing for the Twenty-First Century: Human Resources in Science and Technology, the 142 page Proceedings of this symposium, is available for $50 from the Commission on Professionals in Science and Technology, 1500 Massachusetts Ave., NW, Suite 831, Washington, DC 20005.

SCIENCE AND ENGINEERING: ATTRACTIVE TO WOMEN?

Intervention programs can help increase the numbers of women who pursue careers in science and engineering fields, concludes a report released today by the National Research Council. But the fraction of working women in science and engineering jobs remains much smaller than that of men.

"Most research universities weed out students who don't seem to fit the traditional mold of being a scientist, engineer, or mathematician," said Marsha Lakes Matyas, director of the Women in Science project for the American Association of the Advancement of Science and co-editor of the report. "But some successful intervention programs show that it's possible for many of these students to excel."

The report is drawn from papers presented at a conference about intervention programs to increase the participation of women in science and engineering. It provides information on how these intervention programs effectively work toward attracting women to and keeping them on a career track in science and engineering fields.

A summary chapter gives tips on how to structure, fund, and implement effective intervention programs. Such programs serve several purposes, the report says, "including providing proof that women scientists and engineers do exist, serving as points of contact with others interested in particular disciplines, offering opportunities for career advancement, as well as the development of leadership and managerial skills, recognizing outstanding performance by women, and forming networks that cut across many traditional boundaries."

A "glass ceiling" blocks many women's professional progress not only in academe, but also in government and industry. "Women scientists and engineers are more likely to be unemployed and underutilized than their male counterparts," writes Esther M. Conwell, research fellow at Xerox Corp., in her chapter on promoting science and engineering careers in industry. "Once employed, women in industry face both lower salaries than their male peers and invisible barriers to vertical and lateral movement in the corporate structure."

Conwell's chapter highlights the efforts of three large manufacturers — Hughes Aircraft, Corning, and Xerox — to break the glass ceiling through programs designed to ensure the professional progress of the women they employ.

Such programs create a "level playing field" that can help overcome many barriers confronting women in science and engineering. Mentors, peer programs, and networking opportunities all help women "find out what's going on, gain political skills, and obtain continual reassurance" that the difficulties they face are neither unique nor insurmountable, notes Garrison Sposito, professor of soil physical chemistry at the University of California, Berkeley, in his chapter on promoting science and engineering careers in academe.

Scholarships, research grants, and fellowships also can make a difference in encouraging women to pursue advanced degrees in science and engineering. "People awarding some fellowships are trying to be more aggressive about getting more women to apply," Matyas said. "Then they're being careful that the number of women who get fellowships reflects the proportion of women applicants."

In 1988, while women comprised almost half of the applicants for the Howard Hughes Medical Institute's predoctoral fellowships in biological sciences, two-thirds of the awards went to men. In 1992, half of the applicants were women, and half of the awards went to women.

Increasing numbers of women are applying for graduate fellowships sponsored by the NSF. But the report notes, "the percentage of women receiving awards is almost always smaller than the percentage of women applying," particularly in chemistry, mathematics, and computer science.

"We need to shift from a *singular* strategy of 'survival of the fittest' to a *broader portfolio* of strategies to develop human potential to its fullest," notes Linda S. Wilson, president of Radcliffe College, in her chapter on the benefits of diversity in the science and engineering workforce. "[T]alent and capability are far more widespread in the population than our education systems and policies assume."

The conference was organized by the National Research Council's Committee on Women in Science and Engineering, chaired by Mildred S. Dresselhaus, professor of electrical engineering and physics and MIT.

Science and Engineering Programs: On Target for Women? is available for $19.00 (prepaid) plus shipping from the National Academy Press, 2101 Constitution Ave., NW, Washington, DC 20418.

MEETING FOR WIDOM

A special meeting on Toeplitz and Wiener-Hopf Operators was held in Santa Cruz, California on September 20–22 to celebrate the 60th birthday of Harold Widom and to recognize his contributions to the mathematical community. The meeting was jointly sponsored by the Mathematics Department at the University of California at Santa Cruz and the Mathematical Sciences Research Institute at Berkeley. I have known Harold Widom as both a student and a colleague, and so I was asked to say a few words about his teaching and research at the conference. Most of those remarks I am repeating here.

In the fall of 1968, Harold Widom joined the faculty of the University of California, Santa Cruz. At that time, I was an undergraduate there and was enrolled in his real analysis course. I remember this course as the most delightful in both my undergraduate and graduate years. In the weeks before I was to speak I tried to think about what made that course in analysis so special. How does one become a really effective and inspiring teacher? Truthfully, I'm not really sure.

Harold's teaching techniques were not very complicated. He didn't use any gimmicks or worry about curriculum reform. He lectured very quickly, and we worked very hard. In two quarters of analysis we covered all of junior Rudin and his own lectures on Lebesgue integration.

Each lecture was carefully planned and crystal clear. But the analysis was not presented as simply a dry, logical development of definitions and theorems. He somehow taught us to see the soul and beauty of the subject. Harold also has the knack of making complicated arguments simple. He showed us that analysis was a process and that we were looking for answers. Most importantly, he loved analysis and mathematics, and we could see that. Our class had about 10 students, and at least three of us went on to get Ph.D.'s in analysis.

I was so taken by this look into higher mathematics that I became a graduate student at Santa Cruz, and later Harold became my thesis advisor. As his student, he introduced me to lots of beautiful mathematics: orthogonal polynomials, operator theory, Toeplitz operators, and special functions. It is an art to be a good thesis advisor. One needs to find a reasonable and interesting problem. Finding hard

by Estelle Basor, Cal Polytechnic, San Luis Obispo

problems is easy for Harold. I was only his second Ph.D. student, and I helped him figure out how to give "doable" ones. My first problem did not work out, but I kept on trying until things came together. Throughout this process he was very encouraging, patient, and fair.

Harold has had, so far, seven Ph.D. students, and four of us have been women. I believe we understood not only the strength of his mathematical ability but that his sense of integrity and fairness would never let us down.

Prior to coming to Santa Cruz, he taught at Cornell University, University of Chicago, University of California, Berkeley and Stanford University. His research accomplishments are known to many. He showed that the spectrum of a Toeplitz operator is connected and also proved an index formula for Toeplitz operators with piecewise continuous symbol. Later, he generalized the Szegö Limit Theorem for Toeplitz Determinants to functions with singular symbols and also to the block Toeplitz case. He gave a beautiful operator theory proof of the original Szegö formula and then extended these results to other classes of operators, such as pseudo-differential operators.

We often hear or read that our universities "require excellence in teaching and research" from their faculty. However, we all know that in fact teaching is often neglected in favor of research. I was fortunate to have a teacher and colleague who excelled at both and who inspired many students, especially women, to pursue mathematics. I can only try to do as well.

SCITECH

SciTech is a hands-on science center located in Aurora, Illinois. Their mission is to increase science literacy. The interactive exhibits are designed to help people learn that science is interesting, accessible, and fun. SciTech is a place where people of any age are encouraged to explore, discover and experiment. Exhibits of new technology are placed side-by-side with interactive exhibits that illustrate the fundamental scientific principles upon which they are based.

SciTech is a resource for mathematics and science teachers, a place where children and

families can learn about frontier science, developing technologies and the unifications of the laws that govern both the tiniest parts of the world and the greatest expanses of the universe.

The program also places a heavy emphasis on reaching out to populations that are underrepresented in math and science careers. For the past two years, they have been running a program called SciTech Clubs for Girl Scouts. Support and mentoring are provided for troops of Girl Scouts to build hands-on exhibits for display on the exhibit floor. Funding has been received from the Department of Energy for the program, and the DeWitt Wallace-Reader's Digest Fund a National Initiative has recently awarded them a three-year grant to expand and disseminate it nationally.

At the heart of the program are female science and construction mentors who teach the girls the science behind their exhibit and help them construct the exhibit. It is coordinated by a female electrical engineer who formerly worked at AT&T Bell Labs. This program reaches girls aged 9–14 years and gives them an out-of-school experience in science and in using tools to make a real exhibit for use by SciTech's 70,000 visitors per year. There are now over 20 exhibits that were built by girls scouts.

The role models provided the girls and the personal contact with a real scientist have been even more important than the instruction in science they receive. The confidence they get in being able to build things is also an important aspect of the program.

They are constantly looking for science and technical mentors as well as construction mentors to work with the girls. Also, they are looking for co-sponsors to purchase exhibit materials. If you can help, write or call SciTech, 18 West Benton, Aurora, IL 60506, (708) 859-3434.

BARBIE UPDATE

As most of you have probably heard by now, Mattel has removed "Math class is tough" from Talking Teen Barbie's database. I'll report more later on press response to the issue, but for now will tell you about the comics.

The "Sylvia" cartoon on the subject is now gracing my office door: 1) Stung by the controversy involving their talking Barbie doll, which says "Math class is tough," Mattel announced plans for a talking Ken doll that will say: "Barbie, let me put my career on hold ... 2) "And work at a dead-end job until you complete your education, and then if you like, you can leave me for a younger guy." "We feel it's only fair," said a Mattel spokesperson. (I overheard my husband trying to explain it to a couple of male students, but they didn't "get it").

The "Back Bench" comic strip in the Toronto *Globe and Mail* ran a funny series November 23–26. A sample: 1) Remove the tapes! 2) Prepare Barbie for surgery! We're taking out the offending "Math class is tough" tape now! Stat! 3) Break out her little bolero-post operative ensemble and wheel her to "Barbie's own operating room!" We're going in! 4) This is the one time I wish we'd spent the few extra bucks and never gone with that little plastic scalpel.

BRIEF NOTES

Women in Engineering: Gender, Power, and Workplace Culture by Judith S. McIlwee and J. Gregg Robinson, State University of New York Press, 1992 is a descriptive study of male and female engineers and their experiences in college and on the job.

The legislation to establish a Commission on Women in the Science and Engineering Workforces (HR 3476, Morella) did not clear both Houses of Congress before adjournment in October: the House passed it in September, but it never got to the Senate floor. A related bill (HR 3475, also sponsored by Morella) considered more controversial — it establishes skilled-labor training programs for women — passed the Senate without incident.

Posters for Women's History Month (March) may be ordered from OEES/WHM, P.O. Box 438, Blue Hill, ME 04614. The Organization for Equal Education of the Sexes (OEES) offers 97 posters in support of multicultural education, featuring women of many races and ethnic groups and women with disabilities. Three poster series focus on outstanding women, careers, and dropout prevention. A brief biography or lesson plan accompanies each poster.

ADVERTISEMENTS:

ALLEGHENY COLLEGE - DEPARTMENT OF MATHEMATICS - We invite applications for a two-year position. The position starts Fall of 1993 and may be renewed or converted to a tenure track position. Faculty are expected to maintain professional and scholarly activity and be committed to excellence in teaching. Teaching load is six courses per year on a semester calendar. Allegheny has a network of NeXT computers, and the college provides excellent support for use of computing in courses. Applicants must have a Ph.D. in mathematics by August, 1993. Send curriculum vitae, graduate transcripts, and three letters of recommendation (one should address teaching) to: Ronald E. Harrell, Dept. of Mathematics, Allegheny College, Meadville, PA 16335.

ALMA COLLEGE- DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE, Alma, MI 48801-1599 - Tenure track position in mathematics for the Fall of 1993. Candidates should enjoy teaching a wide variety of undergraduate courses, be committed to excellence in teaching and possess the Ph.D. Duties include advising, assisting with curriculum revisions, supervising student projects and active scholarship. Alma College is a selective, private liberal arts college known for the quality of its programs in the sciences. Closing date is 21 January 1993. Send a cover letter, resume, copy of graduate transcript and three letters of recommendation including evaluation of teaching to: M.A. Nyman, Chair, Mathematics and Computer Science Department., Alma College, Alma, Michigan 48801-1599.

BALL STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Applications are invited for a tenure-track position at the rank of Assistant Professor in the Department of Mathematical Sciences, Ball State University, effective August, 1993. A doctorate in one of the mathematical sciences, completed by August 23, 1993, and evidence of successful college or university teaching are required. Demonstrated research potential is preferred. Salary and benefits are competitive and commensurate with qualifications. Duties include teaching, predominantly at the undergraduate level, mathematical research, and professional service. The Department of Mathematical Sciences includes faculty in pure and applied mathematics, statistics, actuarial science, and mathematics education. The department offers a range of academic programs leading to B.A., B.S., M.A., M.S. and M.A.E. degrees in these areas. Outstanding candidates in any area of the mathematical sciences will be considered, although preference will be given to candidates whose research interests are compatible with those of the present faculty or with departmental needs. Candidates with interests in differential equations or number theory are encouraged to apply. Initial evaluation of applications will begin in December and will continue until position is filled. Interested applicants should request a departmental application form from: Dr. Norman K. Lee, Chair, Faculty Search Committee, Department of Mathematical Sciences, Ball State University, Muncie, IN 47306-0490. email: OONKLEE@LEO.BSUVC.BSU.EDU

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 . For full consideration, completed applications should be received by December 31, 1992. Send applications to: Bill Keane, Chair, Mathematics Dept., Boston College, Chestnut Hill, MA 02167. Email: keane@BC.edu.

BOWLING GREEN STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS AND STATISTICS, Bowling Green, OH 43402-0221. The Department anticipates a position in (Applied Analysis/Computational Mathematics) and/or (Group Theory or Combinatorics). We have 33 faculty, 65 full-time graduate students, and a growing doctoral program (15 Ph.D.'s awarded in the last three years). The selected candidate, who must have a Ph.D. in Mathematics, will be expected to pursue research, teach two courses per semester, work with graduate students, and eventually direct Ph.D. dissertations. Those with post-doctoral experience are encouraged to apply. Candidates are expected to have a strong research record (or potential) in an area compatible with current faculty. Salary competitive. Please provide vita,

publication list, official transcript, and have three letters of recommendation (one concerning teaching) sent by February 1, 1993 to: Professor A. M. W. Glass, Chair, Department of Mathematics and Statistics, Bowling Green State University, Bowling Green, Ohio 43403-0221.

BROWN UNIVERSITY - MATHEMATICS DEPARTMENT - Visiting Position - The Mathematics Department of Brown University will have a Distinguished Visiting Professorship available for the academic year of 1993-94. This position is open to a research mathematician at the Associate or Full Professor level. Preference will be given to mathematicians whose research interests are clearly related to those of present members of our Department. The Visiting Professor will be asked to teach two courses (or if part-time, one course) per semester, at the graduate or advanced undergraduate level. The position may be filled by two half-time visiting professors. Mathematicians who are interested in this position should submit a Curriculum Vitae and a list of publications to the Visitor Search Committee, Department of Mathematics, Brown University, Providence, Rhode Island 02912. Applicants may also send a statement of research interests and/or ask up to two mathematicians to send letters of recommendation. For full consideration, applications should be received by the Mathematics Department by January 31, 1993.

CALIFORNIA STATE UNIVERSITY - BAKERSFIELD - DEPT. OF MATHEMATICS - 9001 Stockdale Hwy., Bakersfield, CA 93311-1099. Lecturers (renewal possible) September, 1993. All areas considered: statistics, remedial, and mathematics education. Masters degree to teach non-remedial courses. Willing to work closely with a diverse student population. Open until Feb. 15, 1993 or until filled. Send letter of application, vita, copy of transcripts and three letters of recommendation to: Dr. Leland Webb, Chair, Search and Screen Committee, Dept. of Mathematics, California State University, Bakersfield, 9001 Stockdale Hwy., Bakersfield, CA 93311-1099.

CALIFORNIA STATE UNIVERSITY - LOS ANGELES - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - The Department of Mathematics and Computer Science invites applications for three tenure track positions at the assistant or associate level for a starting date of late June or September 1993. Our main areas of interest are Geometry, Statistics, Combinatorics and Math Education. Ph.D. required (Ph.D. or Ed.D. in Math Education). Considerations will start February 1, 1993. Send inquiries to: Marshall Cates, Chair, Department of Mathematics and Computer Science, California State University at Los Angeles, 5151 State University Drive, Los Angeles CA 90032

CENTRAL MICHIGAN UNIVERSITY - DEPARTMENT OF MATHEMATICS - One to two tenure track positions for Fall, 1993, subject to budgetary approval. Rank is open but candidates at senior ranks should have experience directing doctoral dissertations. Priorities are: 1. Mathematics Education, 2. Statistics. Candidates should have doctorate in appropriate field, promise of excellence in teaching, demonstrated research capability, and an interest in problems of teaching mathematics at the College and University level. Preference given to candidates whose research complements existing departmental interest. Duties include teaching and research with normal teaching load of 9 semester hours. Candidates in Math Education should have K-12 teaching experience, ability to teach undergraduate math courses, and expectations of participating in field-based experiences. Salaries are competitive and benefits include university paid TIAA, medical, dental, and group life. Send resume, transcripts, and names of three references to R.J. Fleming, Dept. of Mathematics, Central Michigan University, Mt. Pleasant, MI 48859 by January 24, 1993. Late applications will be received while positions remain open.

CLARKSON UNIVERSITY - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - The Department of Mathematics and Computer Science at Clarkson University invites applications for 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 numerical analysis or computational mathematics. Rank and salary are negotiable. Applications including vita and names of at least three references must be received by March 1, 1993. Starting date is August 16, 1993. Applications should be submitted to Professor A. Fokas, Department of Mathematics and Computer Science, Clarkson University, Potsdam, NY 13699-5815. Position #437

CORNELL COLLEGE - DEPARTMENT OF MATHEMATICS - Cornell College, a private undergraduate liberal arts college, invites applications for a tenure track appointment in its Department of Mathematics to teach introductory statistics for social sciences, mathematical statistics, and other courses determined by the needs of department and interests of the candidate. Appointment at the assistant professor level to begin in the fall of 1993. PhD or ABD in statistics or related area required; interdisciplinary interests welcome. Cornell College has attracted national attention for its distinctive academic calendar under which faculty teach, and students take, one course at a time in month-long terms. The entire campus of over 129 acres is included on the *National Register of Historic Places.* Send letter of application, vitae, record of teaching excellence and three letters of recommendation to Ed Hill, Professor and Chair, Department of Mathematics, Cornell College, 600 First Street West, Mount Vernon, IA 52314-1098. Formal consideration of applications begins January 15 and will continue until the position is filled.

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.

EDUCATION DEVELOPMENT CENTER, INC. - CONNECTED GEOMETRY PROJECT - Research and Development Assistant/Curriculum Developer - The Connected Geometry project based at Education Development Center is developing innovative curriculum materials for high school geometry. The responsibilities of this full-time staff position include the design and development of student materials and teacher guides;classroom testing of curriculum; and review and organization of materials, research and software. Qualifications include curriculum writing, mathematics teaching, strong writing and organizational skills and ability to work independently and with diverse groups. Contact: June Mark, EDC, 55 Chapel Street, Newton, MA 02160.

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.

GEORGIA SOUTHERN UNIVERSITY - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - Applications are invited for a tenure-track position as either an Assistant or Associate Professor starting September 1, 1993. Requirements include a Ph.D. in Computer Science or closely related field with training/experience in more than one of the following four areas: Operating Systems,

Parallel and Distributed Systems, Networking, and Data Communications. Candidates must also provide evidence of dedication to outstanding teaching. Duties include teaching graduate and undergraduate courses in computer science and supervision of research projects for M.S. degree candidates concentrating in computer science. Qualified applicants should send a letter of application, curriculum vitae, unofficial transcripts of all college work, and three letters of recommendation by February 15, 1993. The letter of application and/or vitae must specifically address all requirements listed above. Send to Dr. John A. Rafter, Landrum Box 8093, Georgia Southern University, Statesboro, GA 30460-8093. The names of applicants and nominees, resumes, and other general non-evaluative information are subject to public inspection under the Georgia Open Records Act.

GRAND VALLEY STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Assistant Professor or Instructor (tenure eligible) positions in Mathematics and Developmental Mathematics. Starting August 1993. Candidates must be professionally active, have strong teaching recommendations, and have a commitment to undergraduate research and teaching, including the use of technology in the classroom. Ph.D. required for candidates in Mathematics with preference given to Analysis or Topology. Master's degree (Ph.D. preferred) required for candidates in Developmental Mathematics; must have strong mathematical backgrounds, and provide evidence of a commitment to teaching pre-calculus level mathematics. Send resume, three reference letters, teaching philosophy statement, and letter describing qualifications by 1/11/93 to: Mathematics Search Committee, Mathematics Department, Grand Valley State University, Allendale, MI 49401.

ILLINOIS STATE UNIVERSITY, DEPARTMENT OF MATHEMATICS - The Department of Mathematics at Illinois State University invites applications for Chairperson. Applicants must have a doctorate in Mathematics or Mathematics Education, a strong record of achievement in research and teaching, and demonstrated leadership and administrative skills. Experience with undergraduate programs is necessary and graduate programs desirable. Rank and salary are commensurate with qualifications. Duties begin on or about August 1, 1993. The ISU Department of Mathematics has 44 full-time faculty positions and offers undergraduate and master's programs in Mathematics and Mathematics Education as well as a Ph.D. program in Mathematics Education. Send a letter of application, a complete vita, and names and addresses of at least three references to Charles B. Harris, Secretary, Mathematics Chair Search Committee, 4240 Department of English. Illinois State University, Normal, IL 61761 by February 15, 1993.

INDIANA STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - The Department of Mathematics and Computer Science invites applications for the position of Chairperson. Applicants should have a doctorate in Mathematics or Computer Science, a record of successful teaching and research with credentials sufficient to justify appointment at the rank of Professor, and commitment to promoting research, teaching and other scholarly activities. Applicants should possess demonstrated leadership skills necessary to chair a large department which has diverse teaching and research responsibilities. The Department offers BS and BA degrees in Mathematics, Mathematics Education and Computer Science, as well as MS and MA degrees in Mathematics and Mathematics Education. Salary and rank will be commensurate with qualifications and experience. Please send a letter of application and vita, and have three letters of recommendation sent to: Chairperson Search Committee, Department of Mathematics and Computer Science, Indiana State University, Terre Haurte, IN 47809. Screening of applications will begin February 1, 1993, and continue until the position is filled. U.S. citizenship or eligibility for U.S. employment will be required.

INDIANA STATE UNIVERSITY - MATHEMATICS EDUCATION - Applications are invited for an anticipated tenure-track position in mathematics education to start in August 1993. Candidates must have an earned doctorate, preferably in Mathematics Education. Preference will be given to candidates who have pre-college teaching experience. Duties will include supervision of student teachers and teaching mathematics and mathematics education courses. Please send a letter of application, vita and have three letters of reference sent to: Chairperson of Search Committee, Department fo Mathematics and Computer

Science, Indiana State University, Terre Haute, IN 47809. Screening will begin February 17, 1993 and continue until the position is filled.

INDIANA UNIVERSITY - PURDUE UNIVERSITY AT INDIANAPOLIS (IUPUI) - DEPARTMENT OF MATHEMATICAL SCIENCES - The Department of Mathematical Sciences at IUPUI is seeking applicants for two tenure-track positions to begin in August, 1993. Rank is open depending on qualifications. Applicants must have an earned doctorate by the starting date, either a strong research record or excellent research potential, and a commitment to quality graduate and undergraduate teaching. Some preference may be given to applicants in algebra, scientific computing and applied statistics. However, strong applicants from all areas of mathematical sciences are encouraged to apply. IUPUI is a comprehensive urban university with over 28,000 students. The department offers programs of study leading to Purdue University B.S., M.S. and Ph.D. degrees and we anticipate significant growth in our faculty during the next few years. The University offers competitive salaries and provides excellent fringe benefits. Send resume and three letters of recommendation to Prof Bart S. Ng, Chair, Department of Mathematical Sciences, IUPUI, 1125 E. 38th St., Indianapolis, IN 46205-2820. Closing date: February 1, 1993. Late applications will be considered until positions are filled.

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 research 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.

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 to pursue 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.

MACALESTER COLLEGE - MATHEMATICS/COMPUTER SCIENCE DEPARTMENT - 1600 Grand Ave., St. Paul, MN 55105 - Applications are invited for a one year position in Mathematics for academic year 1993/1994. Candidates must have a Ph.D. and a strong commitment to teaching and research in an undergraduate liberal arts college; they need not be entry level. Applicants should send a resume and

arrange for three letters of reference to be sent to John Schue at the address above. Evaluation of applications will begin on January 4 and will continue until the position is filled.

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.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY - OPERATIONS RESEARCH CENTER/ DECISION SCIENCES PROGRAM - The Operations Research Center/Decision Sciences Program at MIT is seeking a qualified Research Associate (temporary position/part-time) to work with faculty and administrative staff to develop support for the Decision Sciences Program, particularly its Transactional Data Laboratory. The Decision Sciences Program is a multidisciplinary research and educational program that collaborates with several existing centers as well as some new activities at MIT. The Program focuses on generic concepts and methodologies that cut across numerous scientific and technological specialties in varied fields in the physical, social, and economic sciences, in applied domains throughout engineering, medicine, and management, and in the manufacturing and service industries. A core of about 40 faculty and staff are committed to the development of the Program. As a centerpiece of the Decision Sciences Program, the Transactional Data Laboratory permits researchers to not only explore transactional data acquisition technologies, but also to conduct controlled scientific testing - both on campus and in real-world settings - of proposed statistical inference procedures developed at MIT. The Research Associate would assist in the preparation of proposals to various funding institutions and agencies to garner support for the Transactional Data Laboratory and the Decision Sciences Program. Further, the Research Associate would meet with representatives from potential funding sources to generate interest and involvement. Candidates for this position should have a strong technical background in operations research and statistics, at the level of either the master's or the doctoral degree. Excellent interpersonal and writing skills are also important. Please send resumes to: Ms. Paulette Mosley, Administrative

Officer, Operations Research Center/Decision Sciences Program, Massachusetts Institute of Technology, Room E40-107, One Amherst Street, Cambridge, MA 02139-4307.

MIAMI UNIVERSITY - DEPARTMENT OF MATHEMATICS AND STATISTICS - The Department of Mathematics and Statistics anticipates, pending budgetary approval, one or more tenure track assistant professorships beginning August, 1993. Duties include teaching undergraduate and graduate courses, continuing scholarship, and service. Applicants should have a Ph.D. in pure or applied mathematics by August , 1993. Applicants in all areas of mathematics will be considered; however, preference will be given to candidates in the areas of optimization, numerical analysis, algebra and complex analysis. Please send vita, graduate transcript and three reference letters to Mathematics Search, Department of Mathematics and Statistics, Miami University, Oxford, Ohio 45056. Screening of applications will begin on January 11, 1993.

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.

MOORHEAD STATE UNIVERSITY - MATHEMATICS DEPARTMENT, Moorhead, MN 56563 - Tenure track position at rank of assistant professor to begin September, 1993. A Ph.D. or Ed.D in mathematics education, eligibility for licensure at some level K-12 and good communication skills are required. Preference will be given to candidates with successful teaching experience at the K-12 or college level. Interest in teaching an elementary education methods course and evidence of ability to work effectively as a member of a teaching team are desirable. Duties include teaching a secondary mathematics education methods course, elementary education content courses and undergraduate mathematics courses Other responsibilities include advising secondary mathematics education majors, supervising student teachers, developing in-service workshops, working on assigned committees and maintaining an appropriate level of professional activity. Apply to Milton Legg, Chair, Mathematics Department.

OCCIDENTAL COLLEGE - DEPARTMENT OF MATHEMATICS - Los Angeles, California - Applications are invited to a tenure-track position in the Department of Mathematics at the assistant or associate professor level. Excellence in teaching and substantial professional achievement are the major expectations. The department is involved in curricular reform and encourages innovative teaching. The normal teaching schedule is 5-6 courses per year. New faculty members are currently released for one course during the initial year. Some institutional support for extended leaves is available. Occidental College is a selective private college of the liberal arts and sciences with 1650 undergraduate students, a college faculty of 133, and a mathematics faculty of nine. Occidental is located in northeast Los Angeles, easily accessible to USC, UCLA and Caltech. Salary is competitive. An excellent benefits package includes a choice of health care plans, tuition grants for children of faculty, and a mortgage subsidy program. Completed applications must include a current resume and three letters of reference (at least one evaluating teaching performance and potential). Please include a clear statement of commitment to teaching in a liberal arts college environment as well as indicating professional goals. All materials

should be received by February 16, 1993. Address all materials to Faculty Search Committee, Department of Mathematics, Occidental College, 1600 Campus Drive, Los Angeles, CA 90041.

PURDUE UNIVERSITY - CALUMET - DEPARTMENT OF MATHEMATICS, COMPUTER SCIENCE & STATISTICS - The Department of Mathematics , Computer Science and Statistics will have one (1) tenure-track mathematics position available for August 1992 at the rank of Assistant Professor. Requirements: a Ph.D. in Mathematics. Responsibilities will include undergraduate and graduate teaching, research, and curriculum development and oversight. Candidates with expertise in numerical analysis, combinatorics, or history of mathematics will be given preference. Submit a letter of application, a curriculum vita, graduate and undergraduate school transcripts. Also, arrange for three (3) letters of recommendation, at least one (1) of which addresses your research potential and at least one (1) of which addresses your teaching ability. All material should be sent to: Professor Jay Wood, Department of Mathematics, Computer Science and Statistics, Purdue University Calumet, Hammond, IN 46323. Review of documents will begin on January 4, 1993 and will continue until position is filled. A representative of the Department will be interviewing at the Employment Register associated with the Annual Meeting of the American Mathematical Society, San Antonio, Texas, January 1993.

PURDUE UNIVERSITY - CALUMET - DEPARTMENT OF MATHEMATICS, COMPUTER SCIENCE & STATISTICS - The Department of Mathematics, Computer Science and Statistics at Purdue University Calumet announces a tenure-track position in mathematics education available in August 1993. The salary will be commensurate with qualifications and experience. The duties and responsibilities include: teaching a range of mathematics courses including content and methods courses for prospective K-12 teachers, supervising field experiences, working collaboratively with public schools, and active involvement in research. Applicants should hold a doctorate in mathematics or mathematics education and at least a master's degree in mathematics. Candidates should also have a strong commitment to teacher education and to quality teaching at both the graduate and undergraduate levels. Review of applications will begin December 1, 1992 and continue until the position is filled. To apply, submit a letter of application, full curriculum vitae, graduate and undergraduate transcripts, and three letters of reference (at least one of which addresses your research potential and at least one of which addresses your teaching ability) to: Professor J. Paul McLaughlin, Department of Mathematics, Computer Science and Statistics, Purdue University Calumet, Hammond, IN 46323.

RENSSELAER POLYTECHNIC INSTITUTE - TROY, NY 12180 - MATHEMATICAL SCIENCES DEPARTMENT - J.G. Ecker, Chair - Applications are invited for a tenured or tenure-track position starting in September 1993 in applied mathematics, with a preference for someone in mathematical programming/optimization. Ph.D. with strong research and teaching potential required for junior level appointments and demonstrated outstanding record required for senior level appointments.

RHODE ISLAND COLLEGE - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - One tenure-line faculty appointment at the rank of Assistant Professor may be available pending approval of funding. To teach a variety of graduate and undergraduate courses. Requirements include a doctorate (which must be completed by September 1, 1993) and expertise in at least one of the following areas: geometry, mathematics education, applied statistics. Preference will be given to applicants with college teaching experience, with experience in the use of technology in the college classroom, and with scholarly research and academic accomplishment. Salary competitive; excellent benefits. Applications must be received by March 12, 1993. Send letter of application, resume, transcripts and three letters of reference to Office of Personnel Services, Rhode Island College, Providence, RI 02908, Attention: Math/CS Search.

RUTGERS UNIVERSITY - NEWARK - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - We anticipate one Moses Newall Combs Assistant Professorship beginning September 1992 contingent on funding. This is a three-year non-renewable term appointment. Candidates should have recently received a Ph.D., show outstanding promise for research in mathematics, and demonstrate a commitment to affective teaching. Preference will be given to candidates with research interests similar to those in the department. The teaching load will be two courses per semester. Applicants should send a

curriculum vitae and arrange for at least three letters of recommendation, including one which addresses teaching, to be sent directly to the Personnel Committee, Department of Mathematics and Computer Science, Rutgers University, Newark, NJ 07102.

SAINT JOHN'S UNIVERSITY/COLLEGE OF ST. BENEDICT - DEPARTMENT OF MATHEMATICS- The joint Department of Mathematics invites applications for a one year term position in mathematics. Ph.D. preferred, evidence of excellence in teaching required. Please send a letter of application, vitae and three letters of recommendation before February 15, 1993 to: Director of Personnel Services, Saint John's University, Collegeville, MN 56321. Applications received after February 15, 1993 cannot be guaranteed consideration.

SCRIPPS COLLEGE - DEPARTMENT OF MATHEMATICS - CLAREMONT, CALIFORNIA, 91711 - Scripps College is seeking outstanding candidates for a two-year position as Assistant Professor of Mathematics commencing Fall, 1993. (The position is potentially tenure-track, pending budgetary considerations.) Candidates must submit evidence of excellence in undergraduate teaching and continuing mathematical activity as well as commitment to play a major role in the development of a mathematics curriculum at a liberal arts college for women. The teaching load is five courses, including pre-calculus and calculus as well as other offerings such as upper-division mathematics classes and mathematics for liberal arts students. Teaching at the graduate level on an occasional basis is also possible. Scripps College is one of the six undergraduate and graduate institutions of the Claremont Colleges. The successful applicant will become a member of the inter-collegiate mathematics group with approximately 40 faculty in all areas of mathematics; the group meets regularly for research seminars. Send vita and statement of teaching interests and philosophy and direct three letters of reference to: Chair, Mathematics Search Committee, Scripps College, 1030 Columbia Avenue, Claremont, CA 91711, Consideration of applications will begin January 15, 1993 and continue until the position is filled.

SOUTHWEST MISSOURI STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Southwest Missouri State University Department of Mathematics. An Assistant Professor position in Mathematics Education is anticipated beginning August 20, 1993. This is a tenure-track position. Applicants must have a Ph.D. or Ed.D. in Mathematics Education, evidence of excellence in teaching, and a commitment to continued research. For this position preference will be given to applicants with research interests compatible with those of the current faculty. Demonstrated proficiency in both spoken and written English is required. Duties include teaching, research, and service. Send application (resume, three letters of reference, graduate transcripts, and a letter of interest) to Dr. M. Michael Awad, Head, Department of Mathematics, Southwest Missouri State University, Springfield, MO 65804-0094. To ensure consideration, application materials should be received by February 1, 1993.

STATE UNIVERSITY OF NEW YORK AT STONY BROOK - DEPARTMENT OF MATHEMATICS/INSTITUTE FOR MATHEMATICAL SCIENCES - The Mathematics Department and Institute for Mathematical Sciences invite applications for vacancies starting September 1993. In the Department there is a special interest in junior appointments in the areas of algebra, geometry, complex analysis, differential equations and mathematical physics, and there may be an opening for a senior geomter. The Institute for Mathematical Sciences has openings in the area of dynamical systems for post-doctoral or junior faculty positions (from one to three years) and for senior visiting positions. Exceptional research accomplishments or promise required. Contributions to educational missions expected. All applicants will be considered both for the Institute and for the Stony Brook Mathematics Department, or for a joint appointment; only one application should be submitted. Salary and rank dependent on qualifications.There is no absolute deadline for submission of applications, but applications received before February 15, 1993 will be given preference. Applications should be sent to: Search Committee, Department of Mathematics, SUNY, Stony Brook, Stony Brook, NY 11794-3651

SYRACUSE UNIVERSITY - DEPARTMENT OF MATHEMATICS - Box 1, Syracuse, New York 13244-1150 - A position may be available in the area of mathematics education at open rank beginning Fall 1993. Candidates should have outstanding research ability and evidence of excellence in teaching.

Responsibilities include: Teaching and advising undergraduate and graduate (M.S. and Ph.D.) students in mathematics education; directing and conducting research in problems of curriculum, learning, and teaching. We have particular interest in the application of technology to these areas. Send a letter of application and vita with a list of publications, and have three letters of reference sent to Philip T. Church, Search Committee Chair.

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 Ph.D 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.

TRINITY COLLEGE - DEPARTMENT OF MATHEMATICS - The Department of Mathematics at Trinity College anticipates the authorization to search for an assistant professor to fill a one year position, academic year 1993-1994. The teaching load is five courses per year (3/2). Requirements: Ph.D. in mathematics or ABD; strong evidence of teaching excellence at the undergraduate level. Applicants should send only a c.v., a statement of teaching interests, three letters of reference (at least one of which addresses teaching), and one self-addressed, stamped envelope to: Search Committee Chair, Dept. of Mathematics, Trinity College, Hartford, CT 06106. We will review applications as they are received, and anticipate filling the position by late March.

TUFTS UNIVERSITY - DEPARTMENT OF MATHEMATICS - The Department of Mathematics invites applications for the following positions: Assistant Professorships, two or three positions, to begin Sept. 1, 1993. Initial one-year contract, renewable to a maximum of three years. Ph.D., promise of strong research and evidence of strong teaching ability required. Relation of research interests to those of members of the department will be a consideration. Research interests preferred: For Position No. 1, probability and statistics; Position No. 2, Lie group representations; Position No. 3, combinatorial group theory including braid theory. Send application with Position Number and three letters of recommendation by March 1, 1993, to R. Weiss, Search Committee Chair,. Tufts University, Math Department, Medford, MA 02155.

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 teaching qualifications - to Search Committee Chair at:Union College Mathematics Department, Schenectady, New York, 12308.

UNIVERSITY OF ALABAMA - HUNTSVILLE - DEPARTMENT OF MATHEMATICAL SCIENCES - The Mathematical Sciences Department of the University of Alabama in Huntsville invites applications for two or more tenure track faculty positions beginning in September 1993. Rank and salary will depend on the credentials of the appointee. A Ph.D. in mathematics or related field with emphasis in applied mathematics, evidence of good teaching skills, and excellent research ability are essential. Preferred specialty areas include discrete mathematics, mathematical modeling, fluid dynamics, differential equations, numerical analysis, and probability/statistics. Send letter of application, vita, and three letters of reference to Peter M. Gibson, Chairman, Mathematical Sciences Department, University of Alabama in Huntsville, Huntsville, AL 35899. Review of applicants will begin February 3, 1993, and continue until all positions are filled.

UNIVERSITY OF ALABAMA - TUSCALOOSA - DEPARTMENT OF MATHEMATICS - The department will have, beginning August 16, 1993, a tenure-track position at the rank of assistant professor or higher for an applicant whose research interests are preferably in fluid dynamics and compatible with those of the existing faculty. Some expertise in computational methods is desirable. The successful candidate shall have completed the Ph.D. degree, or equivalent, by August 15, 1993 and demonstrated excellence in both teaching and research. Applicants should send curriculum vitae, reprints and/or preprints and at least three letters of recommendation to: Search Committee, Department of Mathematics, The University of Alabama, Box 870350, Tuscaloosa, AL 35487 - 0350. Preliminary inquiries may be addressed to Prof. A.M.J. Davis (205-348-1991; e-mail adavis@ua1vm.ua.edu).

UNIVERSITY OF CONNECTICUT - AVERY POINT - DEPARTMENT OF MATHEMATICS - Applications are invited for an anticipated full-time position at the Assistant Professor level for the Avery Point campus. The Avery Point campus is located in the Groton-New London area. A Ph.D. in Mathematics, experience in teaching at the college level, demonstrated talent in teaching undergraduates, and evidence of ability to contribute to the research mission of the department are required. Salary will be competitive, commensurate with qualifications. Screening will begin February 1, 1993, and continue until the position is filled. Send curriculum vitae and have at least three letters of reference sent to: Professor Jerome Neuwirth, Department of Mathematics, University of Connecticut, U-9, 196 Auditorium Rd., Storrs, CT 06269-3009.

UNIVERSITY OF DELAWARE - DEPARTMENT OF MATHEMATICAL SCIENCES - 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 HAWAII - MANOA - COLLEGE OF NATURAL SCIENCES - The College of Natural Sciences is one of four colleges in the Colleges of Arts and Sciences, and consists of about 150 faculty members in 8 departments (Botany, Chemistry, General Science, Information and Computer Sciences, Mathematics, Microbiology, Physics and Astronomy, and Zoology), 1 undergraduate program (Biology), and 2 interdisciplinary graduate specializations (Ecology, Evolution and Conservation Biology, and Marine Biology). Duties: Chief academic and executive officer of the college reporting to the Sr. VP for Academic Affairs; administration with strong instruction and research responsibilities; oversees an annual budget in excess of $10 million. Minimum Qualifications: An earned doctorate and achievements that meet the university criteria for tenure as full professor in one of the departments of the college; demonstrated commitment to administration; a dynamic leader committed to excellence in teaching, research, and service. Desirable Qualifications: Record of instituting effective teaching methods; knowledge of the various natural science fields, expressed through meeting the needs for modern instruction and research in these fields; appreciation of the potentials of disciplines to interact synergistically, expressed through the creation of interdisciplinary programs; experience in the diverse responsibilities characteristic of a natural science college; commitment to the ideals of a liberal education; ability to lead collegially, consult readily and delegate responsibly; vision of science education and research compatible with Hawaii's multi-cultural setting and its other unique attributes; ability to generate support by communicating the college mission; record/commitment to assist faculty in obtaining funds from public and private sources; experience and adaptability in fiscal and personnel management. Starting Date: July 1, 1993 (preferred). Salary: Commensurate with qualifications. Applications to be reviewed on January 4, 1993. Send letter, current cv, names, addresses and telephone numbers of 5 professional references and a concise statement of how applicant meets qualifications. Address to: Dr. Kiyoshi Ikeda, Interim Assistant Vice President for Academic Affairs, University of Hawaii at Manoa,

2444 Dole Street, Bachman 105, Honolulu, Hawaii 96822. Inquiries should be directed to Dr. Rochelle MacArthur (808) 956-4568.

UNIVERSITY OF IDAHO - DEPARTMENT OF MATHEMATICS AND STATISTICS - Tenure track assistant professor beginning August 1993. Qualifications: Ph.D. in Math; strong teaching and research potential; research specialty in discrete mathematics with research interests close to that of current faculty. For details contact: C.J. Potratz, Mathematics and Statistics, University of Idaho, Moscow, ID 83843 (208) 885-6742. Review begins 2-1-93.

UNIVERSITY OF MASSACHUSETTS AT AMHERST - DEPARTMENT OF MATHEMATICS AND STATISTICS seeks a senior mathematician who will interact with the Department's Center For Geometry, Analysis, Numerics and Graphics for a tenured position at the full or associate professor level. Such a person must have an outstanding record of research in one or more areas of geometric analysis, such as differential geometry, partial differential equations, calculus of variations and several complex variables. Preference will be given to applicants with: very strong teaching credentials; a history of high-level leadership, organization and management in reserach at the Ph.D. and postgraduate level; and experience with the use of computational methods in research. Send vitae, publication list and three letters of recommendation to David R. Hayes, Head, Department of Mathematics and Statistics, University of Massachusetts, Amherst, MA 01003; email: dept@math.umass.edu. Should be received no later than March 1, 1993.

UNIVERSITY OF NEBRASKA - LINCOLN - DEPARTMENT OF MATHEMATICS AND STATISTICS - We invite applications for two Assistant Professor tenure-track positions beginning in fall 1993. Candidates must have a Ph.D. in Mathematics by August 1993, and have excellent teaching ability and outstanding research potential in an area that complements existing expertise in the department. Strong preference given to candidates in the areas of: (1) combinatorics and graph theory; or (2) nonlinear partial differential equations with emphasis on applications, dynamical systems, or numerics. Send vita and three letters of recommendation to Search Committee Chair, Department of Mathematics and Statistics, University of Nebraska-Lincoln, Lincoln, NE 68588-0323. The University of Nebraska-Lincoln is committed to a pluralistic campus community through Affirmative Action and Equal Opprotunity and is responsive to the needs of dual career couples. We assure reasonable accomodation under the Americans with Disabilities Act. Contact AA/EO at (402) 472-3417. The review of applications will begin February 1, 1993, and continue until suitable candidates are selected.

UNIVERSITY OF NEBRASKA - LINCOLN - DIVISION OF STATISTICS - Assistant Professor, tenure track position in statistics, starting Fall, 1993. Ph.D. required with evidence of excellent teaching skills and strong research potential. The division offers M.S. and Ph.D. degrees in statistics. Send a curriculum vitae and three letters of reference by February 1, 1993 (or until a suitable candidate is found) to: D.H. Park, Search Committee Chair, Division of Statistics, Dept. of Mathematics and Statistics, University of Nebraska - Lincoln, Lincoln, NE 68588-0323. The University of Nebraska-Lincoln is committed to a pluralistic campus community through Affirmative Action and Equal Opprotunity and is responsive to the needs of dual career couples. We assure reasonable accomodation under the Americans with Disabilities Act.

UNIVERSITY OF NORTH CAROLINA - GREENSBORO (UNCG) - DEPARTMENT OF MATHEMATICS - The Department of Mathematics seeks applications for a tenure-track position as Assistant Professor specializing in Computer Science. Initial appointment is for 4 years, 9 months per year, beginning August 1, 1993. The position requires the successful applicant to have completed a Ph.D. in Computer Science by the appointment date and to have a commitment to high quality research and teaching. The Department of Mathematics provides a congenial environment for cooperation between mathematicians, statisticians and computer scientists. Current computer science members in the department have active research projects in image processing, parallel processing, and formal language theory. The department currently offers a B.S. in computer science and is planning a M.S. degree to start in 1994. UNCG takes pride in its strong liberal arts tradition. It has approximately 12,000 students of

whom 75% are undergraduates. The University is situated in a historic city of 190,000 and is within easy driving distance of North Carolina's beautiful beaches and mountains. Send vita, transcripts and 3 letters of references to Computer Science Search Coordinator, Department of Mathematics, UNCG, Greensboro, NC 27412. Screening of applications will begin February 1, 1993, but new applications will be considered until the position is filled.

UNIVERSITY OF NORTHERN IOWA - DEPARTMENT OF MATHEMATICS - CEDAR FALLS, IA 50614-0506 - Tenure-track position to aid in teaching general education courses and to support our majors and graduate students. Applications and nominations are invited for a position at the assistant professor level. The department seeks to hire a candidate with a Ph.D. in Analysis. Candidates with expertise in any area of modern analysis will be considered; however, individuals with specialization in Functional Analysis are preferred. Appointment is for the academic year beginning in August 1993. Salary is very competitive; fringe benefits are excellent. Application screening begins February 15, 1993, and will continue until an appointment is made. For more information, contact Gregory Dotseth, Mathematics Department, University of Northern Iowa, Cedar Falls, IA 50614-0506. (319)-273-2397 dotseth@math.uni.edu

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 commensurate 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 SAN DIEGO - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - USD is a small Catholic university seeking qualified candidates for a tenure-track position at the Assistant Professor level in the Department of Mathematics and Computer Science. Preference will be given to good candidates with a Ph.D. in Computer Science or Applied Math. Teaching load is 7 three-hour courses per year at the undergraduate level. The primary commitment of the university is teaching but scholarship and professional activity are strongly encouraged. Salaries start at $35,000. Send resume, three letters of recommendation, and a summary of recent teaching evaluations to Dr. Clare Friedman, University of San Diego, 5998 Alcala Park, San Diego, CA 92110. Applications should reach us no later than March 1, 1993.

UNIVERSITY OF SOUTH CAROLINA - COLUMBIA - DEPARTMENT OF MATHEMATICS - The Department of Mathematics invites applications for anticipated tenure track positions for the Fall of 1993 at all ranks. Applications in all areas of mathematics will be considered. Faculty research is supported by excellent in - house library and computing facilities. The Ph.D. degree or its equivalent is required, and all appointments will be consistent with the Department's commitment to excellence in research and in teaching at the undergraduate and graduate levels. A detailed resume, including a summary of research accomplishments and goals, and four letters of recommendation should be sent to: Dr. George F. McNulty, Chairman, University of South Carolina, Department of Mathematics, Columbia, SC 29208. E-mail address: mcnulty@milo.math.scarolina.edu

UNIVERSITY OF SOUTHERN CALIFORNIA - DEPARTMENT OF MATHEMATICS -The Department of Mathematics has available several tenure-track or tenured positions at the Assistant and/or Associate Professor level. Applicants must show strong reasearch promise and possess excellent communications skills for teaching undergraduate mathematics courses. The Department of Mathematics also seeks to fill at least one tenured position at the senior level. Successful applicants will have an outstanding record of mathematical research and scholarship, and proven administrative skills for academic leadership. Visiting positions (at all levels) and postdoctoral appointments will also be

available. To apply, please submit the following materials in a single package: letter of application Iincluding your email address and fax number), and a curriculum vitae. Candidates for junior positions should also provide at least three letters of recommendation. Mail applications to Chair of Appointments Committee, Department of Mathematics - DRB 155, University of Southern California, Los Angeles CA 90089-1113.

UNIVERSITY OF TENNESSEE - KNOXVILLE - MATHEMATICS DEPARTMENT - The Mathematics Department of the University of Tennessee, in an effort to significantly improve its research position, sees to fill 3 or 4 tenure-track assistant or beginning associate professorships in several areas. A Ph.D. 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 will begin December 1 and will continue until the positions are filled.

UNIVERSITY OF TEXAS - ARLINGTON - DEPARTMENT OF MATHEMATICS - The Department of Mathematics invites applications for two to three anticipated tenure-track positions beginning with the Fall Semester of 1993. We seek candidates in various areas of Mathematics which are complementary to those of the current faculty and would enhance and support the goals of the Department. Salary and rank are commensurate with qualifications which must include the Ph.D. degree (in hand or expected by September, 1993). Assistant Professor candidates must show strong potential for excellence in teaching and research. For an Associate or Full Professorial appointment the candidate must have excellent teaching credentials and a nationally established research record; some success in attracting outside funding is preferred. A resume with three letters of recommendation should be sent to: ATTN: Chair, Recruiting Committee, University of Texas at Arlington, Department of Mathematics, Box 19408, Arlington, TX 76019-0408.

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 graduate courses 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 application. 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. Preference will be given to applicants who can serve well in an increasingly diverse university community.

UNIVERSITY OF WASHINGTON - 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 WISCONSIN - EAU CLAIRE - DEPARTMENT OF MATHEMATICS - Two tenure track positions in Mathematics - the first in August, 1993 and the second in August, 1994. A Ph.D. in Statistics or in Mathematics with an emphasis in probability or mathematical statistics is required for the first position; a Ph.D. in Statistics with an emphasis in reliability is required for the second. Responsibilities include teaching a wide variety of undergraduate courses, scholarly activity, academic advising, and service. Evidence of excellent teaching potential is required. Send letter of application, vita, complete transcripts, and 3 letters of recommendation, including an evaluation of teaching effectiveness, to David Lund, Mathematics Department, UW - Eau Claire, Eau Claire, WI 54702. Deadline for complete application is February 15, 1993 for both positions. Please specify Position 1 or 2.

UNIVERSITY OF WISCONSIN - MADISON - DEPARTMENT OF MATHEMATICS - Hiring Committee, 480 Lincoln Drive, 223 Van Vleck Hall, Madison, WI 53706 - The Mathematics Department solicits applications for a tenure-track Assistant professor position in the area of Applied Mathematics with an emphasis on large-scale scientific computation. The position would be available in the fall of 1993. All candidates should exhibit evidence of outstanding research and a strong commitment to good teaching. Application forms are available from the above address. The deadline for submission of applications is February 1, 1993. Unless confidentiality is requested in writing, information regarding the applicants must be released upon request. Finalists cannot be guaranteed confidentiality.

UNIVERSITY OF WISCONSIN - PLATTEVILLE - DEPARTMENT OF MATHEMATICS - At least two tenure-track positions in mathematics will be available starting August 22, 1993. A Ph.D. in mathematics or statistics, or a Doctoral degree with teaching experience at the elemenatry or middle school level is preferred. Applicants that are ABD will be considered. Undergraduate teaching will be the primary responsibility. Applicants must furnish evidence of excellent undergraduate teaching experience and communication skills, and be capable of maintaining a continuing program of scholarly activity. The applicant with teaching experience in elemenntary or middle school will be expected to work with local school districts and write grant proposals. The Department of Mathematics is comprised of 21 members who serve a student body of approximately 5000 with majors in Agriculture; Arts and Sciences; Business, Industry and Communication; Education and Engineering. Salary: $30,000 - $35,000+ depending upon qualifications and experience. The names of nominees and applicants who have not requested in writing that their identity not be revealed, and of all finalists, will be released upon request. Send vita, transcript and three letters of recommendation to Dr. Allan Richert, Chairperson, Department of Mathematics, UW-Platteville, Platteville, WI 53818. Deadline: February 12, 1993.

VANDERBILT UNIVERSITY - DEPARTMENT OF MATHEMATICS - 1326 Stevenson Center, Nashville, TN 37240 - Distinguished or Named Professor - We are seeking someone with outstanding research credentials in algebra. The interests of our algebra group include universal algebra, set-theoretic algebra, abelian groups, semigroups, ring theory, ordered algebraic structures, lattice theory, and logic with applications to computer science. Evidence of effective teaching is required. Have vita and 5 letters of recommendation sent to Professor Glenn Webb.

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 of computational 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.

WABASH COLLEGE - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - Wabash College, a liberal arts college for men, seeks a statistician, or mathematician with a strong masters degree in statistics (and a Ph.D. in Mathematics or Statistics) to become a Byron K. Trippet Assistant Professor in Mathematics beginning Fall, 1993. The teaching load is three courses per semester, at least one of which will be statistics, and at least one mathematics. Ph.D. required by August, 1993. This is a tenure track position in accord with the College's guidelines and review procedures and includes research support and a summer research stipend for two years. Send applications by January 30, 1993, to Bonnie Gold, Chair, Department of Mathematics and Computer Science, Wabash College, Crawfordsville, IN 47933.

WARTBURG COLLEGE - DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE - Applications are invited for a tenure-track assistant professor, beginning late August 1993. Teach seven undergraduate courses in mathematics each year. Seeking person with Ph.D. (or Ph.D. candidate) in mathematics; undergraduate teaching experience (TA acceptable); some experience in applied math; and supportive of the mission of a liberal arts college of the Lutheran Church. Review of applications begins January 20, 1993. Send letter of application, resume, transcripts and three letters of reference to Dr. William L. Waltmann, Chair, Dept. of Math. and Comp. Sci., Wartburg college, Waverly, IA 50677.

WASHINGTON STATE UNIVERSITY - DEPARTMENT OF MATHEMATICS - The Department of Pure and Applied Mathematics has a permanent, tenure track position available beginning Fall, 1993. Assistant Professor level, salary commensurate with qualifications and experience. Applications are invited from individuals expert in dynamical systems with special interest in bifurcation analysis. Applicants should have significant mathematical research accomplishments and strong commitment to teaching. The successful applicant's research will be expected to complement existing department research strengths in mathematical modeling, numerical analysis and optimization. The position requires a Ph.D. with competence in teaching relevant graduate and undergraduate courses in Mathematics. Applicants should send a curriculum vitae, a statement of current research and long-term research interests to: Prof. V. S. Manoranjan, Search Committee, Department of Pure and Applied Mathematics, Washington State University, Pullman, Washington 99164-3113. Screening of applications will begin on February 1, 1993.

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, and should be sent to William Cohn, Acting Chair, Wayne State University. Department of Mathematics, Detroit, MI 48202.

WESTERN MICHIGAN UNIVERSITY - DEPARTMENT OF MATHEMATICS - Western Michigan University seeks applications to fill the position of Chair of the Department of Mathematics and Statistics with tenure and the rank of professor beginning July 1, 1993, pending budgetary approval. Position requires a Ph.D. degree in Mathematics and experience in academic administration. Specialization in one of the following is preferred: analysis, computational mathematics, algebraic-topology or graph theory and combinatorics. Applicant must demonstrate excellence in teaching, scholarship and publication. Send letter of application, vita, academic transcripts and three letters of recommendation to Ruth Ann Meyer, Interim Chair, Mathematics and Statistics Department, Western Michigan University, Kalamazoo, MI 49008-5152. Review of applications will begin January 15, 1993 and continue until position is filled

YORK UNIVERSITY - DEPARTMENT OF MATHEMATICS AND STATISTICS - Dept. of Mathematics and Statistics invites applications (subject to final budgetary approval) for one tenure track position (rank open) in Statistics, to commence on July 1, 1993. The position will be a joint appointment between the Department of Mathematics and Statistics in the Faculty of Arts and the Department of Computer Science and Mathematics in Atkinson College, a faculty oriented to part-time students. Applicants must have a completed Ph.D. and proven research and teaching abilities. York University is implementing a policy of employment equity, including affirmative action for women faculty. In

accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents. Applicants should send resumes and arrange for three letters of recommendation to be sent to: Marshall Walker, Chair, Computer Science and Mathematics, Atkinson College or Georges Monette, Chair, Department of Mathematics and Statistics, York University, 4700 Keele Street, North York, Ontario, M3J 1P3, Canada, Fax: (416) 736-5757, E-mail: MATHSTAT@VM1.YORKU.CA. The closing date for applications is January 15, 1993.

YORK UNIVERSITY - DEPARTMENT OF MATHEMATICS AND STATISTICS - invites applications (subject to final budgetary approval) for one tenure-track appointment (junior level) in Numerical Analysis, to commence July 1, 1993. The successful candidate will be expected to engage in reserach in Numerical Analysis and to play an active role in the Applied Mathematics section of the Department. Applicants must have a completed Ph.D. and proven research and teaching abilities. York University is implementing a policy of employment equity, including affirmative action for women faculty. In accordance with Canadian immigration requirements, priority will be given to Canadian citizens and permanent residents. Applicants should send resumes and arrange for three letters of recommendation to be sent to: Dr. Georges Monette, Chair, Department of Mathematics and Statistics, York University, 4700 Keele Street, North York, Ontario, M3J 1P3, Canada. Fax: (416) 736-5757. Email: MATHSTAT@VM1.YORKU.CA. The closing date for applications is January 15, 1993.

The Geometry Center

The National Science & Technology Research Center for Computation and Visualization of Geometric Structures

The Geometry Center is based at the University of Minnesota in Minneapolis in 15,000 square feet of space overlooking the Mississippi.

The Geometry Center is looking for highly talented and motivated individuals with a strong background in mathematics or computer science. The Center has created a unified computing environment centered on math and supporting:

- math and computer science research,
- software and tool development,
- application development,
- mathematical visualization,
- video animation production, and
- high school and college math education.

Apprentices

In the past, successful apprentices have included those who wish to take time off from college to get work experience, and those who have graduated from college and want to get more experience before deciding on a future career or further graduate education. The unique Center environment reflects elements of both the corporate and academic worlds.

Based on his or her interests and the needs of the Center, an apprentice will work with senior staff or faculty on a primary project related to the areas listed above. In addition, each apprentice will assist in visitor orientation and related tasks.

The salary will be at the level of a full time graduate student, between $20,000 and $25,000/year according to background.

Postdoctoral Fellowships

Up to three fellowships will be awarded for start up to Fall, 1993. They are for one year with the possibility of a one year extension. Remuneration will normally be $40,000/12 months if there is no other support.

Applicants will be accepted from all branches of the mathematical sciences; preference may be given to those whose work relates to current interests of the Center. A very high level of accomplishment and breadth of education is expected from the applicants and also a substantial computing background. Applicants should also be willing to supervise student assistants and otherwise participate in the education program of the Center.

Research Professorships

Application is encouraged and welcomed from those with full or partial independent funding who would like to consider residence in the intensive computer environment of the Center. A few grants may be available up to half-salary or $30,000.

Applications

To apply, please send a letter of interest including a description of your research program along with a resumé and letters of recommendation as appropriate to:

Angie Vail, Sr. Admin. Dir.
The Geometry Center
1300 South Second Street
Minneapolis, MN 55454

Please address letters of inquiry regarding research professorships to Professor Albert Marden, Director, The Geometry Center.

The University of Minnesota is an equal opportunity educator and employer.

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.

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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