AWM
ASSOCIATION FOR WOMEN IN MATHEMATICS

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PRESIDENT'S REPORT

It is a great pleasure to write this report on the occasion of our 20th Anniversary celebration. It is also a pleasure to inaugurate the new format of our *Newsletter* which Anne Leggett, Patricia Cross, and Lisa Gallo worked hard to produce.

This is my last President's report. Before writing it, I looked at the statement I wrote for the *Newsletter* three years ago where I described some of the issues I hoped to address.

> We must continue to find ways to identify talented young girls and encourage their interest in mathematics. We must make sure that women are guided to the best graduate program for their needs and abilities. Women traditionally have been underrepresented in the top rank graduate programs; we should understand why that is true and help to correct it. Those of us who are professionally active in research, industry, or education have an obligation to our young women colleagues to support them at the beginning of their research or teaching careers, to bring them into the appropriate network, and to find creative ways in which to help them through the difficulties of two career relationships and childrearing. Through our collective experience and efforts we can increase the number of active women in the mathematical sciences and bring their work to the attention of the rest of the community.
>
> I hope in the near future we will also be able to broaden our membership base to include more of our colleagues in statistics, operations research, and computer science, so that we become an association for women in the mathematical sciences.

We have made some progress in these and other directions in the past two years; there are also areas where much remains to be done. At the end of this report I have included a summary of AWM activities from January 1989 to January 1991. After looking at it, I think you will agree with me that we have come of age as we enter our 21st year.

IN THIS ISSUE

AWM
ASSOCIATION
FOR WOMEN IN
MATHEMATICS

The Association was founded in 1971 in Boston, MA. The purpose of the association is to encourage women to study and to have active careers in the mathematical sciences. Equal opportunity and the equal treatment of women in the mathematical sciences are promoted.
The *Newsletter* is published bi-monthly.
The Editor welcomes articles, letters, and announcements.
Circulation: 3,500

There are some people I would like to thank for supporting and helping me over the last two years. First my family, Dick, Isaac, and Sam, who were always supportive and tried not to complain (too much) about the extra trips I had to take. Next I have to thank Patricia Cross, who let me talk her into becoming the AWM Executive Director and who is doing a wonderful job. Rhonda Hughes, my predecessor, did what she could to ease my transition into this job. She also had the original ideas for the Schafer Prize and the Hay Award. Carol Wood, my successor, has always been a source of well-reasoned advice and comments, as has Linda Keen. Alice Schafer was instrumental in the transition periods at the Wellesley office, helped with interviewing and hiring, and was a great source of information on past history and practice. Anne Leggett never complained when my reports were late and always corrected my errors (spelling and otherwise). My assistant, Carmen Crocker, spent a lot of time helping me with AWM correspondence and paper work. Finally, I would like to thank Thinking Machines Corporation for its generous contributions of release time and expenses during my term of office.

This has been a great and exciting time to be the President of the AWM. Happy Anniversary — we have a lot of things to celebrate!

Jill Mesirov

AWM Activities: January 1989 to January 1991

1. Panels

January 1989, Phoenix (Joint Meeting AMS/MAA)
Gender differences in mathematical ability
Gila Hanna, Pat Rogers

August 1989, Boulder (Summer Meeting AMS/MAA)
Women in Operations Research: Their work and experiences
Margaret Brandeau, Janice Hammond, Margaret Wright
(ORSA outreach)

January 1990, Louisville
(Joint Meeting AMS/MAA)
Affirmative Action
Beverly Anderson, Lida Barrett, Mary Gray, Michael Reed

August 1990, Columbus (Summer Meeting AMS/MAA)
Enrichment programs in urban public schools
Harvey Keynes, Jacqueline Rivers, Paul Sally

July 1990, Chicago (SIAM National Meeting)
Applied mathematics in industry
Rosemary Chang, Linda Kaufman, Ann Stehney, Marjorie Stein, Cathy Willis

2. Sonia Kovalevsky High School Days

Simmons College, April 1989
Cleveland State University, October 1989
Sweet Briar College, October 1989
Rivier College, March 1990
Simmons College, April 1990

1989 program supported in part by Exxon
Seeking long term support and creation of "how to" materials

3. Graduate Student Outreach

University of Colorado at Boulder, August 1990
In conjunction with AMS/MAA summer meeting; informal lunch with senior women mathematicians and local graduate students
Jointly funded with Exxon

Workshops for Graduate Students and Postdocs
To be run in conjunction with national meetings of AMS, MAA, SIAM
First workshop to be held at 20th Anniversary
Funded by NSF and ONR

4. Prizes and Awards

Alice T. Schafer Undergraduate Prize in Mathematics
Funded by donations from AWM, MAA, AMS, and individuals
Total received to date = $19,400
First prize awarded in April 1990
Linda Green and Elizabeth Wilmer
Seeking an additional endowment to make prize self-supporting
Award ceremony at Summer Business Meeting

Louise Hay Award for Contributions to Mathematics Education
Awarded annually at the January Business Meeting
First Award: January 1991

5. Resource Center

At AWM office in Wellesley
Career information
Information on gender issues in mathematics
Resource information

Reorganizing and rewriting materials
AWM *Newsletter*: new format
Profiles of Women in Mathematics: The Emmy Noether Lecturers
AWM Brochure
Directory of Women in the Mathematical Sciences
Careers for Women in Mathematics

Exploring ways to create database of information

Supported in part by special grant from Exxon

6. 20th Anniversary Celebration

The Future of Women in Mathematics
A symposium featuring 10 outstanding women mathematicians within 10 years of the Ph.D.
To be held at the January 1991 Joint Meetings in San Francisco

Joint AWM/MAA/AMS invited address at January 1991 Joint Meetings

First NSF/ONR sponsored workshop for women postdocs and graduate students

AAAS session on Mathematics and Public Policy, March 1991
Organized by Beth Ruskai
Speakers: Ingrid Daubechies, Mary Gray, Barbara Grosz, Fern Hunt, Mary Wheeler

7. Outreach to other societies

Creation of new category of member for other math societies
Affiliate member
Designated liaison

American Association of University Women
Co-sponsor for symposium, October 1990
"Women in Science & Mathematics: Pipeline to the Year 2000"

Society for Industrial and Applied Mathematics
Continuing presence at National Meeting
First joint panel: July 1990
Membership mailing endorsed by SIAM President

American Water Works Association
Co-sponsor for conference
"Expanding the Vision of Opportunity in Science, Engineering, and Mathematics"

Mathematical Association of America
Joint committee to coordinate the programs of MAA's WAM project and AWM

Operations Research Society of America
Membership mailing
August 1989 panel

American Mathematical Society
Joint exhibit at AAAS meeting

8. Noether Lecturers

January 1989, Phoenix: Mary Wheeler

January 1990, Louisville: Bhama Srinivasan

January 1991, San Francisco: Alexandra Bellow

9. Speakers Bureau

10. NSF Travel Grant Program

Three-year program to fund travel to research conferences for women mathematicians
Seeking renewal of grant

CALL FOR NOMINATIONS! ALICE T. SCHAFER MATHEMATICS PRIZE

The second annual Alice T. Schafer Mathematics Prize in the amount of $1000 will be awarded to an undergraduate woman for excellence in mathematics. All members of the mathematical community are invited to submit nominations for the Prize, to be awarded in April 1991.

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. Nominations should be postmarked no later than March 29, 1991 and sent to: Schafer Prize Committee, AWM, Box 178, Wellesley College, Wellesley, MA 02181.

In 1990, there were two Schafer Prize winners: Linda Green, University of Chicago, and Elizabeth Wilmer, Harvard University. The winners and Honorable Mention recipients were presented their awards at the Joint Mathematics Meetings in Columbus, Ohio in August 1990.

NSF-AWM TRAVEL GRANTS FOR WOMEN

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

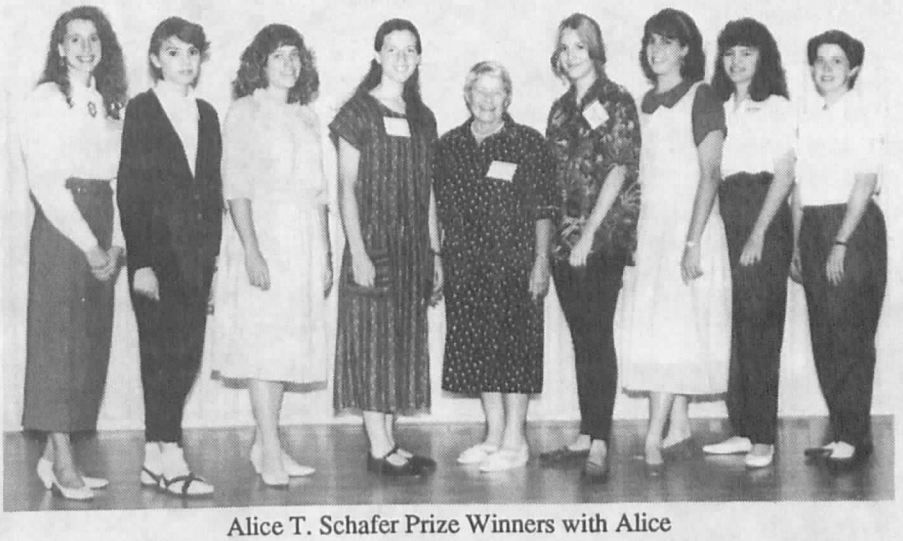
The Travel Grants. The grants will support travel and subsistence to a meeting or conference in the applicant's field of specialization. A maximum of $1000 for domestic travel and of $2000 for foreign travel will be applied.

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

Target Dates. The next three due dates for applications are February 1, May 1, and August 1.

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

SUMMER MEETING IN COLUMBUS, AUGUST 1990



Alice T. Schafer Prize Winners with Alice

Changing of the Guard:
Jill Mesirov & Carol Wood,
Presidents Past & Present

Executive Committee
R.M.Charney, B.A.Case, E.G.D.Jones, S.Geller, J.Baglivo
A.T.Schafer, C.Wood, J.Mesirov, R.Hughes

ICM-90, KYOTO

AWM Panel: A. Weiss (Canada), G. Thornley (New Zealand), A. Negishi (Japan), K. Tenenblat (Brazil), R. Hans-Gill (India), M.T. Lozano (Spain), Hu H.-S. (China)

After the Panel: Hu He-sheng, unidentified male, Karen Uhlenbeck

The International Congress of Mathematicians takes place every four years and was held in Kyoto, Japan on August 21-29, 1990. Since recent ICM's had included an AWM panel, I decided to continue this tradition, provided I could find an adequate supply of speakers and yen; thanks to the AMS/NSF program and Wesleyan University my travel was provided, and I indulged myself by bringing along a favorite travelling companion, my number-one daughter. This was not only a pleasant choice for me, but Martha provided key assistance in arranging the panel, as well as taking notes and photographs. The account below of the panel is largely her expert work, although all the mistakes are doubtless mine. After more than a few anxious moments wondering if my invitations had been received, and with a lot of help from an old girls' electronic network, the panel began to take shape in early summer. The ICM-90 General Secretary, Huzihiro Araki, was very accommodating in arranging a suitable time and place; he advised, quite correctly, that we hold the panel during the day, since transport to and from KICH (the congress hall) would be difficult in the evening, and so we scheduled for Saturday, August 25, 1:30-2:45, sandwiched between the plenary lectures and the traditional musical performances that day. Attendance was indeed good, although I heard a few grumbles about lost opportunities for sightseeing that afternoon. Another person in Kyoto essential to the planning stage, who cheerfully tracked down registrants for Patricia via e-mail, was N. Tanaka; Ms. Tanaka's helpfulness was typical of what I encountered repeatedly in my dealings with the ICM staff. The hierarchy was clear, with women in less important posts; I felt however that the women went out of their way to assist me, and I was both charmed and heartened by the way in which they "oiled the gears" for AWM! As one of the two "outsiders" invited to thank the ICM organizers at the closing ceremony for a job well-done, I could do so with real enthusiasm on behalf of AWM.

As it turns out, I needn't have been nervous about the panel, since an embarrassment of riches awaited me in Kyoto. The International Mathematical Union met prior to the ICM, with Linda Keen, Lenore Blum and Alice Chang as members of the U.S. delegation, along with Andrew Gleason and Ron Graham. To our great pleasure, and in contrast with previous years, the IMU delegations from several countries included women, three of whom agreed on the spot to serve as panelists: Rajinder Hans-Gill, Kati Tenenblat, and Gillian Thornley, along with Hu He-sheng, who had already been invited to participate. The three who joined the panel on short notice added much to its spirit, as well as to its breadth and distinction. I also met A. O. Kuku, the President of the African Mathematical Union, whose Commission on Women in Mathematics in Africa, chaired by Grace Alele-Williams, was organizing a symposium on the mathematical education of women in Africa, to be held in December 1990 in Nigeria.

A change in policy toward the participation of women at ICM occurred since ICM-86 at Berkeley, it appears. Nicolaas Kuiper, the Chair of the all-powerful Program Committee, sought me out to describe how he had proceeded to remind his sectional chairs of the existence of women. I quote from his report to IMU, included here with his permission (panel chairs are the heads of the sectional committees who select speakers):

> The chairman suggested to the Panel chairmen to not overlook women. He observed in the course of the years in direct contacts or by telephone, that this suggestion was well understood. We believe that times develop and we do see more and more good mathematicians in important centers of mathematics in the world who happen to be women. Without difficulty or force we got lists of mathematicians of which a certain number are women. I believe in the next congress this tendency will naturally develop, but one could remember the wish ONCE more for the next International Congress.

On a lighter note, Kuiper mentioned that this may have been the first time an invitation to speak was declined because the invitee was having a baby! (Having guessed her identity correctly I can safely predict that she will get other chances.)

I won't even try to list all the women who did give talks, but list below only the invited speakers. By my count there were six 45-minute invited talks by women, of about 140 overall:

LENORE BLUM (Mathematical Aspects of Computer Science), "A Theory of Computation and Complexity Over the Reals,"

SHAFI GOLDWASSER (Mathematical Aspects of Computer Science), "The Search for Provably Secure Cryptosystems,"

DUSA MCDUFF (Geometry), "New Developments in Symplectic Geometry,"

COLETTE MOEGLIN (Lie Groups and Representations), "Sur les Formes Automorphes de Carré Integrable,"

MARY REES (ODE and Dynamical Systems), "Combinatorial Models in Parameter Spaces of Rational Maps,"

and

EVA TARDOS (Combinatorics), "Strongly Polynomial and Combinatorial Algorithms in Optimization."

In addition, JOAN BIRMAN had the honor of giving an account, in her fine lucid way, of the work of Fields medalist Vaughan Jones, mentioning also the generosity and style of the man, as part of the opening day ceremonies. And KAREN UHLENBECK gave the first of the 15 plenary addresses at the ICM, on "Non-linear Partial Differential Equations and Topology". As part of Karen's introduction, mention was made of her "lineage" as a woman mathematician, going back to Emmy Noether's ICM address. Karen responded that when she was a young mathematician, she didn't think such things were important; now that she is an older mathematician (her choice of words!), she believes that such things matter a lot. Then she proceeded with a beautifully crafted and delivered talk, one of the high points of the ICM for this member of the audience.

Miscellanea about the ICM: There were over 3900 registrants, from approximately 85 countries, with 2300 from Japan and the next largest delegation from the U.S. at 380. Some of the panelists had information about the number of women attending from their home countries, but overall figures were not available. For the AMS/NSF travel awards, 22 women applied; 13 of these were granted.

My thanks to number-two daughter Emily for processing the photographs of the panel, to those of you who helped identify appropriate speakers, and without whose help there would have been no panel, and most of all to the panelists themselves for their generosity in sharing their perspectives.

THE AWM PANEL ON THE STATUS OF WOMEN IN MATHEMATICS

August 25, 1990, at ICM-90, Kyoto

Panelists Rajinder Hans-Gill (India), Hu He-sheng (China), Maria T. Lozano (Spain), Aiko Negishi (Japan), Kati Tenenblat (Brazil), Gillian Thornley (New Zealand) and Asia Weiss (Canada)

AIKO NEGISHI spoke first about the Tokyo Women's Christian University, where she is Professor and Director of the Center for Women's Studies. Her field of mathematics is topology, especially low dimensional manifolds and gauge theory. Her university has a long (64 year) tradition of teaching mathematics. Of the 240 women at the school, many concentrate their studies in mathematics or the mathematical sciences. Most graduates go on to jobs in computer science, working in the computer centers of city banks or as systems engineers and programmers for large companies. Five or six each year teach math in high schools, and a very few go on to graduate work in mathematics. The membership of women in the Mathematical Society of Japan, Negishi noted, is now 204 out of a total of 4610, or 4.4%. Of those 204 women, 28 are professors, 37 are assistant professors, and 139 are part-time lecturers or graduate students.

Although young Japanese women in mathematics are doing well now, Negishi stressed the need for each situation to be examined from an individual's point of view, irrespective of his or her gender. She recommended an article written by a male Japanese mathematician, Makoto Ohtsuka, "The feminine mathematician," as an excellent source of further information about Japanese women in mathematics today.

Negishi went on to describe the institutionalized bias against women in mathematics in the pre-1945 Japanese educational system. Both boys and girls attended six years of primary school, after which the boys continued with five years in junior high, three years in senior high, and three years at the university. Girls, on the other hand, spent four to five years at a girls' high school, followed by three years in junior college. Moreover, in the years

following primary school, girls were instructed in math for only two to three hours per week, whereas boys spent five hours per week in math class. Different textbooks were used for the girls.

Many parents and teachers still think that girls are weak at math, said Negishi, and that they shouldn't study it. This must be improved, she declared. There is a need for university role models and for important posts in decision-making about teaching and education to be given to women. Nonetheless, "things are gradually changing in Japan," Negishi concluded.

ASIA WEISS, Associate Professor at York University in Canada, described the situation in her country as "rather grim." In 1987, of the degrees given in mathematics, 36% of bachelors' degrees, 27% of master's degrees, and 13% of Ph.D.'s went to women. Of all Ph.D.'s given, 27% went to women; mathematics is therefore particularly bad, Weiss concluded. Women account for 15% of all university faculty positions, but only 5% of math faculty. The number of women in part-time teaching, however, approaches 50%.

One of the reasons why so few Canadian women pursue degrees in mathematics, said Weiss, is that many women fail to take higher level math courses in high school and graduate ill-prepared for college level mathematics. There have been a few efforts to remedy this situation, particularly in urban areas, she added. Some blame can be given to professors, who "somehow lose their female math students."

Both Concordia and York Universities have established scholarships for women in the form of first year and summer research awards. Affirmative action hiring for faculty is in place at York, where they are "actively looking for female job candidates. If there is an equal choice between male and female candidates, they must choose the woman." The Engineering Society has up to ten fellowships for women only. Child rearing is also now a legitimate reason for asking for research grants. On the down side, however, Weiss noted that the ongoing effort to get women on faculty committees, because there are so few women, means that each has to work an extra 5 to 6 hours a week.

RAJINDER HANS-GILL, who received her Ph.D. from Ohio State University, is on the faculty of Panjab University in India. When she first came to the school, she was the only woman on the math faculty of twenty; now there are six women on a faculty of twenty-nine. One-third of the Indian delegates at the ICM-90 were women.

Hans-Gill described the situation in India as "full of contradictions." Women do quite well in mathematics and receive half of math degrees awarded up through master's degrees. There is a big drop, however, in the percentage of women who go on to get their Ph.D.'s. Most women who receive their master's then work in the computer industry, teach, or work in prestigious administrative jobs. Many feel the pressure to raise families, and because "there is no tradition of leaving and then returning to mathematics in India," these women are not encouraged to go back and get their Ph.D.'s after their children have grown. Master's degrees are typically received by people aged 20-23, Ph.D.'s by people around 28. "Women need to be encouraged to do math along with their family lives," said Hans-Gill.

Special programs for young mathematicians, especially for women, should be developed, Hans-Gill added. Such programs should provide funds for young mathematicians to attend conferences and visit other universities. Also needed are similar programs for women in their late twenties to continue their work in mathematics. Women need encouragement, said Hans-Gill, because "they will play a great role in mathematics in the future."

Hans-Gill concluded by noting that many Indians are not given the opportunity to study mathematics seriously. Villages rarely have good schools, particularly for women, and the math teachers in religious schools are "not good."

MARIA THERESA LOZANO of the Universidad de Zaragoza in Spain, began by commenting that although 60% of the students at her university are women, only 10% of the math faculty are women. The main reason for this, she explained, is that most women with degrees in mathematics teach in high schools, where the hours are good for women with families. Also, of the few graduate students in mathematics, a very small percentage are women. Most women only work part-time after they are married, and "it's hard to get a Ph.D. working part-time." Although things are slowly improving, there is a need, said Lozano, for more opportunities for Spanish women to go back to work in mathematics.

HU HE-SHENG is Professor of Mathematics at the Institute of Mathematics at Fudan University in Shanghai, works in differential geometry, and advises advanced Ph.D. students. Although there have been many famous women in mathematics (she listed several, ending her list with her mathematical colleague Karen Uhlenbeck), "much of the potential of women has not yet been realized." China's move to modern teaching of mathematics, said He-sheng, is only seventy years young, and the number of women in mathematics is still very small. Of the 147 members of her Institute, only 19 are women. She is the only full professor. 48 of the 215 students in mathematics are women. Very few Chinese women mathematicians are known in the world, said He-sheng. Of the 79 Chinese delegates to ICM-90, only three were women. There are historical and social reasons for the low numbers of women in mathematics, including the traditional lack of encouragement for women to study the sciences, particularly the "more difficult sciences." One can also look to women themselves for explanations, said He-sheng, who explained that she is very busy and has "little time for housework." 1986-89 saw four Chinese women in attendance at the International Mathematics Olympiad, where they were awarded gold and silver prizes. This proves, says He-sheng, that "they have the intelligence and ability." Women must continually be encouraged to have both interest and confidence in mathematics, she concluded.

KATI TENENBLAT, Professor at the Universidad de Brasilia and president of the Brazilian Math Society, explained that the graduate program in mathematics in Brazil is only thirty years old. 10% of math faculty with Ph.D.'s are women; many more (30 to 40%) with master's are women. The National Research Council recently awarded two of its scholarships to women, and women are attracting more attention in high government posts. "The number of women in mathematics is particularly small," Tenenblat concluded, "but hopefully it will increase."

GILLIAM THORNLEY, Professor at Massey University and president of the New Zealand Math Society, described the difficulties for women in mathematics in New Zealand. New Zealand, whose population is roughly three million, has six universities with math departments, each of which is relatively small. The department at Massey has 21 tenured positions in mathematics. Thornley is the only woman. Two of the New Zealand universities have no women on their math faculties, and of the total nine women in tenured positions, two are working part-time, and only five have Ph.D.'s . A sixth is currently working toward hers. Thornley did her Ph.D. before she was married and had to wait ten years until a job opened up. Her husband now works only part-time. Massey has a number of women in untenured positions. These women are employed as tutors or as graduate assistants (who are also working on their Ph.D.'s). One-third of all math graduate assistants are women. "There is some hope that women are coming through," said Thornley. The usual pattern is for students to go overseas to do their Ph.D.'s, however. Thornley thinks that this is bad for the staff, since the presence of graduate students helps put higher priority on research. The New Zealand government recently put through equal opportunity legislation which "has caused a few things to move at universities." A special fund set up by the Vice Chancellor provides two research awards for women faculty, which amounts to teaching relief so that these women may work on their Ph.D.'s. Other grants exist, one of which allowed Thornley to miss an important week of school in order to attend ICM-90.

There has never been, said Thornley, a woman in an associate or full professorship (the top grades among tenured faculty) in a New Zealand university. Some women go overseas to study and stay there or move into other kinds of work. 30% of the women who graduate with degrees in mathematics go into teaching. The situation forces Thornley, she said, to ask herself, "is it right to encourage women to get Ph.D.'s in math in New Zealand if there aren't any jobs for them?" Things are getting better, but there are still many problems, Thornley concluded. I.M.E. and other groups, for example, have been raising awareness of the gender problem in mathematics.

This concluded the official panel, but a panelist from ICM-86, Marie-Françoise Roy, participated in the speakers' luncheon, where she agreed to speak briefly on the developments in the as yet unofficial organization European Women in Mathematics. The organization now has a membership of 120 and is planning its fourth

meeting in either Italy or France. The first meeting in Paris was of 12, the second in Copenhagen of 50, and the third in Warwick of 70. The organization plans to circulate information about its meetings, hold seminars, provide information to high school teachers, and get some press, particularly in women's journals. Roy concluded by noting that 17 of the 117 delegates to ICM-90 from France were women.

After the planned presentations, comments erupted from the floor, leaving the moderator wishing for more time before the music performance at 3 P.M. Asia Weiss added a footnote about the desirability of child care at the Congress, and a graduate student whose name was missed (sorry!) quipped her regret that there weren't more Japanese men in the audience! Adrien Douady reinforced several panelists' remarks by pointing out that encouragement is needed not only for young students but also for older ones going back to mathematics. Martha Smith described briefly an MIT/Stanford study of how men and women students view their talents versus how their professors view them. She averred that subtle and not so subtle differences in classroom teaching and treatment of men and women have true impact. We must all become more sensitive to these differences and to the signals which we unwittingly send. Maria Klawe mentioned how prevalent she found the discouragement of women students in mathematics and sciences, even now, in the western countries, citing the crucial discouraging role played by some high school teachers. At that point time was up, but many lingered, trading addresses, remarks, and information. There was strong interest on the part of several in forming women's associations in their home communities, and requests for advice on how to begin. Perhaps in Zurich at ICM-94 AWM will be joined by EWM, African, Indian, and other societies in sponsoring the next such panel.

Nicolaas Kuiper, the Chair of the all-powerful Program Committee, sought me out to describe how he had proceeded to remind his sectional chairs of the existence of women.

by Martha Coven (Yale University) and Carol Wood (Wesleyan University)

The following account came to me from a Polish mathematician whom I had invited to serve on the panel, but who was unable to participate. I find added poignancy in her request that she remain anonymous; she had serious concerns about her own mathematical future. I mentioned the existence of this text at the AWM panel, but did not read it due to lack of time.

It is known that the general situation of women in a country cannot be considered separately from the general situation of the country. This opinion may be very well illustrated analyzing the effects of Polish economic crises in the 80's on the situation of women in my country. In the 80's the general standard of living went down, making especially the lives of women more difficult. This influenced the level of professional activities of women. The Polish society faced the problem of shortage of various goods or even total lack of them. To buy food, clothes or medicine for their children, mothers had to spend enormous efforts and a lot of time waiting in tedious lines in the stores. For most women it was very difficult to join double duties — professional and family. It was especially difficult in such professions as those of research mathematicians requiring concentration some hours each day. The lack of time for their own work caused most women mathematicians either not to have new results or results not as good as they might be. They didn't have enough time to read articles or books which are absolutely necessary to increase their own knowledge. Of course, all these troubles affected the position of women mathematicians among their colleagues and especially their promotion to higher rank. Some of them lost jobs, others are rather disregarded. Only those who are invited abroad share some prestige and may have a chance to be promoted. In my institute there are 40 women, about 25% of all workers. In the 80's, five of them prepared their Ph.D. theses, while only one managed to finish her habilitation thesis, becoming a docent. None of them became professors. There

are 14 women (about 12%) at the Institute of Mathematics at Warsaw University. Only two of them finished Ph.D. theses, and none prepared a habilitation, while during this same period 15 men could do so. I think that this comparison is very significant or even alarming.

The second factor of the Polish crisis was rapidly growing inflation. This together with the very low salaries of the Polish intelligentsia brought impoverishment to these circles and influenced professional plans of the younger generations, in particular girls. Most of the young people didn't want to study at all. Only 10% of this generation entered universities and higher colleges, the lowest level in Poland since the last war. As research workers were among the lowest paid professions, the young people preferred to choose professions which might bring more reasonable profits, and mathematics is not among these. So, on the one hand it was quite difficult to encourage girls to study mathematics; on the other, those who made such a decision couldn't expect acceptance of their decision, even within their families.

Beginning in January of this year the new Polish government introduced some economic changes and reforms. Consequently the supermarkets provide a lot of goods, but their prices are extremely high in comparison to salaries. For the first time since the last war the Polish intellectuals are not persecuted. However the old troubles have been replaced by others. The growing recession and low national income brought cuts in university budgets. For example, my institute does not have enough money to buy new books, and it cannot offer any grants to cover costs of business trips for its workers. The same problems exist in the other mathematical institutes in my country. The university authorities expect that they won't have enough money for salaries at the end of this year. So the growing unemployment may hit mathematicians. The possibility of losing jobs will bring money conflicts in mathematical institutes, and I don't expect that women mathematicians will be good enough not to lose their jobs. It seems to me that nobody can say how many of them will survive.

Anonymous, Poland, August 1990

INTERNATIONAL STUDY GROUP ON ETHNOMATHEMATICS

The International Study Group on Ethnomathematics (ISGEm) was founded in 1985 under the guidance and inspiration of the Brazilian mathematician Ubiratan D'Ambrosio. Since then, it has held programs and business meetings at the annual conferences of the National Council of Teachers of Mathematics (NCTM) and at the Sixth International Congress of Mathematical Education. In 1990 it became an affiliate of the NCTM.

What is ethnomathematics? The term was coined by D'Ambrosio to imply the influence of sociocultural factors on the teaching and learning of mathematics. The prefix "ethno" encompasses "identifiable cultural groups, such as national-tribal societies, labor groups, children of a certain age bracket, professional classes, and so on," and includes "their jargon, codes, symbols, myths, and even specific ways of reasoning and inferring" (quoted from the first ISGEm *Newsletter*). Alan Bishop suggests that six environmental activities lead to the development of mathematical practices and concepts: counting, locating, measuring, designing, playing, and explaining. There is now ample evidence that people in all societies devise their own ways of doing mathematics, independently of their technological level or what they may have learned in school. Yet these practices are rarely recognized in formal school mathematics.

The *Newsletter* includes papers on current work in the field of ethnomathematics, information on research projects, book reviews, annotated bibliographic entries, and ideas for promoting the study of ethnomathematics. The editor is Patrick Scott, College of Education, University of New Mexico, Albuquerque, NM 87131.

To join the ISGEm and to receive the semiannual *Newsletter*, contact Gloria Gilmer, President; Math-Tech, Inc.; 9155 North 70th Street; Milwaukee, WI 53323; tel (414) 355-5191. Dues are five dollars per year, to cover the costs of the *Newsletter*.

BOOK REVIEW

They're Not Dumb, They're Different: Stalking the Second Tier, Sheila Tobias, 1990, Research Corporation, 6840 East Broadway Boulevard, Tucson, AZ 85710-2815.

I showed this monograph to a mathematician friend, she thought it was about men; I showed it to another, he thought it was about women. Neither was right, however. *They're Not Dumb, They're Different* is about a misunderstood group, students who don't pursue science in college. As with studies of gender we miss important insights unless we consider the perspectives of all the groups involved, in this case students *and* professors (perhaps also administrators, parents, precollege teachers). This is too much to ask for from a study which appears to be the first of its kind. But, as one who has taught many service courses, I found myself wishing for a fuller account of the professors' views and reminding myself that they were outside the scope of the study. Successful implementation of the reforms suggested by this study must take into account the attitudes of those affected, both students and professors, so perhaps we need another study — *They're Not Arrogant, They're Alien(ated).*

As anyone who's read recent reports on science and engineering in the U.S. knows, a serious shortfall in the supply of scientists and engineers has been projected for the near future. Tobias notes that much of the effort to mitigate this problem has taken place at the precollege level. She gives some possible reasons: "reformers ... are most comfortable dealing with problems that have their origins (hence their solutions) elsewhere" and

> [b]ecause they are good researchers, scientists prefer situations in which variables can be isolated and controlled. As anthropologist Sharon Traweek concludes after studying the belief systems of high-energy physicists, "Scientists long passionately for a world without loose ends." For many scientists, then, it seems more logical to begin with *pure substances* (the nation's six-year-olds) and *uniform initial conditions*, than to flounder in the messy bog of motivation, attributes, and prior training exhibited by postsecondary students in their early years at college.

I'm not so sure about this. Dealing with the "messy bog" is certainly an activity for which most scientists have little expertise or inclination, but also for which they would receive little academic reward (of course one can and should ask why this is the case), and which would take considerable time and energy on the part of many students, since recent studies make the messy bog sound like a black hole. The Second International Mathematics Study shows U.S. eighth and twelfth grade students in the lower half and quarter percentiles (some other countries which participated in the study were: Japan, Thailand, England, Israel, Sweden, Swaziland). Stevenson, Lee, and Stigler in their study of elementary schools (*Science*, February 14, 1986) found that

> [p]oor scholastic performance by American children has focused attention on education, especially in mathematics and science. Funds for research on how to improve teaching have been allocated and commissions formed, such as a National Research Council committee exploring a research agenda for precollege education in mathematics, science, and technology. Recommendations to be made by this committee and others that have preceded it concentrate on the nation's secondary schools. The wisdom of this is questionable. Results emerging from a large cross-national study of elementary school children suggest that Americans should not focus solely on improving the performance of high school students. The problems arise earlier. American children appear to lag behind children in other countries in reading and mathematics as early as kindergarten and continue to perform less effectively during the years of elementary school. When differences in achievement arise so early in the child's formal education, more must be involved than inadequate formal educational practices. Improving secondary education is an important goal, but concentrating remedial efforts on secondary schools may come too late in the academic careers of most students to be effective.

However, as Tobias points out, the science and engineering pipeline leaks in many places, and major losses occur during college. The focus of this monograph is the leak at introductory college science courses.

The study enlisted seven graduates who had been science avoiders in college (with one exception who quit science during college), had

demonstrated ability in other fields (anthropology, philosophy, English literature, history, creative writing), and had taken four years of high school mathematics and science and one semester (at least) of college calculus. Each subject took a one-semester introductory physics or chemistry course, did all the coursework and exams, except, perhaps, the final, and was asked "most of all, to observe closely (and to write about) their own personal encounters with the subject matter ... and those of their fellow students." The subjects were articulate and became interested in their courses, and all but one performed extremely well in class. The majority of this volume is a detailed account and discussion of their observations. For instance, one of the subjects (and his classmates) believed his course was graded on a curve. "There was, in fact, no grading 'on a curve' ... . The professor said later that perhaps his posting of a histogram after each exam with the breakpoints for the letter grades may have confused them."

I would have liked more discussion of this point: the subject felt that the classroom atmosphere was made much more competitive and uncomfortable by this supposed grading policy, and other students were obviously upset by it, but apparently no one ever mentioned this problem to the professor though the class had a "fixation on grades." Grades seem to be a bone of contention in many introductory science classes — perhaps because they are a measure whose interpretation differs greatly for students and professors. An example of a nontraditional grading policy is given later in the book.

The subjects' dislike of the cookbook nature of the courses was reflected in many of their observations.

> I do not feel that what this professor is doing can be considered teaching in any complex or complete sense. My understanding is that we are to learn primarily by reading the text, secondarily by doing the problems on our own and comparing our solutions to those on sale in the physics office, and thirdly by mimicking the professor's problem-solving examples. Simply by intuition, I know physics, and more generally science, to involve creativity and finesse; but this man makes it into a craft, like cooking, where if someone follows the recipe, he or she will do well.

Thomas Kuhn in his essay "The Essential Tension" gives an explanation for these methods.

> Except in their occasional introductions, science textbooks do not describe the sorts of problems that professionals may be asked to solve and the variety of techniques available for their solution. Rather, these books exhibit concrete problem solutions that the profession has come to accept as paradigms, and they then ask the student ... to solve for himself [*sic*] problems very closely related in method and substance to those through which the textbook or the accompanying lecture has led him [*sic*]. Nothing could be better calculated to produce "mental set" or *Einstellungen*. ... Even the most faintly liberal educational theory must view this pedagogic technique as anathema. ... [But] at least in the period when it was followed by a term in an apprenticeship relation, this technique of exclusive exposure to a rigid tradition has been immensely productive of the most consequential sorts of innovations.

This is an interesting explanation; however, one might wonder if scientific innovations have occurred despite this pedagogical method or because of it. Other observations made by the subjects were:

> In science in particular, teachers need to narrate with comments such as "what we didn't resolve last time" to let the class know when it is plunging deeper into the material ... [and] to show how the subject is put together, *its grammar*...

> [S]he was frustrated by a "missing overview," what physicist John Rigden, in amazing resonance with Jacki's [the subject's] own metaphor, calls the "story line."

Stigler has also used the metaphor of story to describe differences between elementary school mathematics classes in Japan and the U.S. — Japanese classes tend to have a coherent structure (a story), and U.S. classes tend to be a series of unrelated segments. I believe that by the time they get to college, many students have learned to expect knowledge to be presented as a collection of unrelated facts and skills, and that these students are an important factor in making and preserving the present form of introductory college science courses.

Many of the observations from the study support this belief. For instance, one subject noticed that

> students put down their pencils when the professor discoursed on Aristotle, Galileo, and the history of science. They appeared to enjoy these excursions, but treated them as a kind of relief from having to concentrate so hard. Indeed, when she worked with the students in her study group, she realized that, as a rule, they did not want to talk about the problems conceptually.

The book ends with a short account of a different approach to introductory chemistry, and a comparison of this study with a more statistical four-year study of 300 students: both studies indicate that many students lose interest in science because of the nature of introductory courses. Despite the depressing nature of its findings this is an enjoyable book — it is not often that one reads an account of anyone learning and liking a previously avoided subject.

Reviewer: Cathy Kessel

Book Review Editor:

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EQUITY BIBLIOGRAPHIES

Four bibliographies on equity and science-related careers are available for $3.00 each or $10.00 for the set. Topics range from research on gender differences to hands-on activities. Titles: *Equity in Science and Mathematics*, 10 pages for teachers, administrators, guidance counselors and parents; *Futures Unlimited in Mathematics and Science*, eight pages for secondary students; *Science Stuff for Boys and Girls*, nine pages for elementary students; *Scientific Superstars*, four pages of women in science, their fields of study, and a description of their contributions. Contact Marylin A. Hulme, Consortium for Educational Equity, Rutgers University, New Brunswick, NJ 08903; (908) 932-2071.

EDUCATION COMMITTEE

Our correspondent from California, Leonard Feldman (San José State University), has sent us some news from California and also from Uganda.

Items from California

A Center for Mathematics and Computer Science Education has been established at San José State University. The center will serve as an active link among the Department of Mathematics and Computer Science, the Department of Education, local schools, and, where appropriate, local industry. It will provide outreach for the University to the education community and solicit support for upgrading mathematics education in the region. Dr. James Smart has been the director for 1990, and Joanne Rossi Becker will be the director for 1991.

Also, in May, 1990, the California Commission on Teacher Credentialing approved the San José State University proposal for a California Experimental Mathematics Specialist Credential Program. The purpose of this program is to improve mathematics education in the elementary schools by enrolling experienced elementary school teachers in advanced courses in mathematics (including a course in problem-solving) and mathematics education. Teachers may use the program to satisfy the requirements for the M.A. degree in Education.

Report from Uganda

The Uganda Academy of Sciences has recently been organized. They are particularly interested in encouraging further study of mathematics by all students and wanted some ideas to help bring more women into scientific fields. Although they are not yet ready to form a version of the "Math/Science Network," the concept of role models intrigued them. There is also a Uganda Mathematics Society. At a public lecture sponsored by the society, I spoke on "The Lasting Value of Studying Mathematics."

Makerere University, Uganda, used to be known as an academic institution that met the best of world standards with an international faculty and close connections to Cambridge University, England. Most of the current senior faculty were

educated at Makerere in the 1960's and went on to receive advanced degrees from prestigious universities in England, the U.S., Canada, Australia, etc. Students are competitively selected. Now, because the government is impoverished, faculty and students are striving for a quality education under very severe limitations.

I helped the Institute of Education to plan and conduct a one week workshop for selected instructors of mathematics and science from Teachers Colleges. Unfortunately, these instructors cannot offer similar inservice workshops for primary or secondary school teachers because of lack of funds; teachers cannot afford the minimal cost of transportation and lunch. All public agencies are financially stressed, and most public employees must have some other source of income. The senior people have been able to adapt — they have advanced degrees from overseas universities and are usually established with a personal business, family farm, or outside employment. Junior faculty tend to have a second teaching job.

The people at the university are struggling to overcome significant material and morale problems. Any outside help means a lot to them. For instance, there is a great need for books and for information about graduate scholarships. In the past three years or so, the advent of a stable, honest government has brought in some foreign aid, and assistance from foreign faculty has been an added morale booster.

Chair: Sally I. Lipsey
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AWM CLEAN SWEEP

AWM members have made a clean sweep of AAAS section A elections. Congratulations to: Alice Schafer, Chair; Marian Pour-El, Member-at-Large; and Jean Taylor and Beth Ruskai, Nominating Committee.

JOINT SUMMER RESEARCH CONFERENCES IN THE MATHEMATICAL SCIENCES

The AMS-IMS-SIAM 1991 Joint Summer Research Conferences in the Mathematical Sciences will be held at the University of Washington, Seattle, from June 22 to August 2, 1991. It is anticipated that the series of conferences will be supported by grants from the National Science Foundation and other agencies.

There will be eight conferences in as many areas of mathematics. The organizing committee considered it important that the conferences represent diverse areas of mathematical activity, with emphasis on areas currently especially active, and paid careful attention to subjects in which there is important interdisciplinary activity at present.

The topics and dates of the conferences follow: "Stochastic modeling and statistical inference for selected problems in biology," June 22-28; "Graph minors," June 22-July 5; "Theory and applications of multivariate time series analysis," June 29-July 5; "Stochastic inequalities," July 6-12; "Biofluiddynamics," July 6-12; "Motives," July 20-August 2; "Mathematical aspects of classical field theory," July 20-26; and "Systems of coupled oscillators," July 27-August 2.

The conferences emulate the scientific structure of those held throughout the year at Oberwolfach. These conferences are intended to complement the Society's program of annual Summer Institutes and Summer Seminars, which have a larger attendance and are substantially broader in scope. The conferences are research conferences and are not intended to provide an entree to a field in which a participant has not already worked.

It is expect that funding will be available for a limited number of participants in each conference. Others, in addition to those funded, will be welcome, within the limitations of the facilities of the campus. For more information, see the AMS *Notices*, November 1990. The deadline for receipt of applications is March 1, 1991.

PEOPLE-TO-PEOPLE WOMEN IN MATHEMATICS DELEGATION TO CHINA: June 14 - July 3, 1990

In June of 1989, AWM, at the invitation of the Citizen Ambassador Program of People-to-People International, was to sponsor a delegation on women in mathematics to the Peoples' Republic of China. Due to the tragic occurrences in Beijing on June 4, 1989, that delegation's visit to the PRC had to be cancelled. The Chinese Association for Science and Technology and People-to-People were anxious for the trip to be rescheduled for June 1990. After discussion on whether such a trip should be sponsored by the Association at the AWM Executive Committee meeting in January 1990, AWM decided to withdraw its sponsorship, with the understanding that funds donated to AWM for the China trip could be used for a 1990 delegation if the donors of those funds agreed. The latter were contacted, and all said that their contributions should be used for the 1990 trip. Alice Schafer agreed to lead the delegation, now named the People-to-People Women in Mathematics Delegation to China, as she had been scheduled to do in 1989.

Twenty-one people (twenty delegates and one guest) went on the trip. The group was received enthusiastically in each city visited: Beijing, Xi'an, Fuzhou, and Guangzhou. In Beijing, the delegation met with mathematicians at Peking University, at the Institutes of Mathematics and Applied Mathematics of the Academia Sinica, at Tsinghua University and at Beijing Normal University. In Xi'an, the members of the delegation met with mathematicians at Xi'an Jiaotong University; in Fuzhou, they met with members of the Fujian Women's Federation, the faculty of Fujian Hwa Nan Women's College, and mathematicians at Fuzhou University, Fujian Provincial Economic Center and Fujian Normal University. In Guangzhou they met with members of the Intellectual Women of Guangzhou City Association and mathematicians from South China Normal University.

All over China the delegation was warmly welcomed. Some of the Chinese had felt isolated from the world and enjoyed the chance for the intellectual exchanges. All of the Chinese talked freely about their work and were interested in learning about the delegates' work. Often they spoke about the visit as the beginning of a continuing friendship. At many of the meetings, delegates presented papers, as did the Chinese mathematicians. By the end of the trip, most of the delegates had made at least one presentation. There was much interest in applied mathematics; as a result, delegates with talks on the applications of mathematics and computer science were frequently asked to speak.

Among the people the group met in Beijing at Peking University was Li Zhong, the department chair, and Zhang Zhi-Fen, the first woman in China to receive a Ph.D. in mathematics from Moscow State University. The delegation also met an impressive group of seniors at Peking University who are going on to graduate work in mathematics. A young woman who won a silver medal in the International Mathematics Olympiad held in Poland will be studying at Berkeley this fall. At the Institute of Mathematics of the Academia Sinica, the famous mathematician Professor Wang Yuan talked about his group's work on the Goldbach Conjecture. Feng Xuning spoke about her prize-winning work on coding theory with her co-investigators Wan Zhexian and Dai Zongduo. Rebekka Struik spoke about finite abelian groups, and Stephen Hobbs spoke about a statistics example. Then Shao Xiu-Min spoke about her work on numerical analysis. At Tsinghua University we were taken on a tour of the campus and given an introduction to their programs, after which Gloria Hewitt spoke on polynomial rings.

Also in Beijing, at the Institute of Applied Mathematics Kwei Hsiang-Yun introduced the speakers: Associate Director Feng Kai-Tai who spoke about the Institute; Clara Lim, on computer-aided software; Liu Yan-Pei, on combinatorics; Carolyn Mahoney, on internal and external conditions on graphs; Lei Guang-Yao, on computing approximate inverses; Suzanne Lenhart, on viscosity solutions; and Chang Wei-Bao, a recent graduate of Peking University, who spoke about geographical information systems. At Beijing Normal University, Zhou Jia gave an inspiring talk about overcoming the psychological

barriers of female students, and Yu Xuan-Bei talked about her success in teaching topology to classes of 100 students. Liu Shao-Xue mentioned hearing people at the University of Chicago ten years ago questioning the mathematical abilities of women; Cui Xin Mei talked about the need for proper career guidance for women. [Ed. note: two of these talks appear after this article.] June Trudnak spoke about Hypercard, and Pao-sheng Hsu spoke about writing across the curriculum.

In Xi'an at Jiaotong University, the delegation was welcomed by Zhang Wenxui, Secretary General of the Provincial Mathematics Association, and Jiang Deming, Vice President of the University. Zhang mentioned that this was the first American mathematics delegation to visit the university. After Ma Zhien told about Jiaotong University, Anne Leggett spoke about square roots of finite and infinite matrices; Huang Aixiang, about an operator splitting method on differential equations with boundary conditions; Gerard McDonald, about the nearest point problem; Xu Zongben, about nonlinear operator equations; and Suzanne Lenhart, about viscosity solutions. The delegation was also taken on tours of the computer center and the kindergarten.

In Fuzhou, we met with women members of the Fujian Women's Federation who had made contributions to society in a variety of ways; for example, Zhou Meng-Li told about her bringing plastic surgery to Fuzhou 35 years ago. This was followed by a musical presentation by the children in the provincial kindergarten where the meeting was held.

One day the delegation was split into two groups, one going to the Fujian Economic Center and the other to Fuzhou University and Fujian Normal University. At the Economic Center, the delegation was welcomed by Chang Kong Hong, Secretary of the Fujian Computer Society. Zhangxi Lin, Deputy Director, described the State Economic Information System. The delegates toured the mainframe computer center. The following people made presentations at the Economic Center: Chen Ping on the tendency of prices in Fujian Province, Huang Peng on orthogonal design, Zhengxi Lin on automating routine analysis of financial data, Zheng Xaio Su on uniformly convergent difference methods for singular perturbation of self-adjoint elliptic partial differential equations, Stephen Hobbs on non-parametric regression, Sharon Rewerts on preparation for disaster recovery, Melissa Wilson on collision avoidance of two robot arms, and Ellen Torrance on the pricing of life insurance and annuities. At Fuzhou University, Huang Jin-Ling, the university president, welcomed the delegation and introduced the speakers: Fu Shu-Sheng on uniform integrals, Jacqueline Dewar on using LOGO as a tool for students to experience doing mathematics, Suzanne Lenhart on viscosity solutions, Gerard McDonald on the nearest point problem, and Katye Sowell on taxicab geometry. The delegation toured the university library which had an impressive 1,000,000 volumes with 1,700 foreign journals, 800 of which are American. (Interestingly, the extensive mathematics journal collection is available on open shelves, while *TIME*, *Newsweek*, and *Reader's Digest* are behind locked doors.) At Fujian Normal University, there was a general exchange about women in the University, exchange students and curriculum after a presentation by Erica Voolich on the history of mathematics education in the U.S. There was also a tour of their computer center, the most impressive one that we saw on the trip.

One of the most interesting schools that the delegation visited was Hwa Nan Women's College, which is currently headed by its eighty-six-year-old founder, Dr. Yu Bao-Sheng. Hwa Nan is the only private women's college in China and is staffed by retired Chinese women professors (mostly of chemistry) who graduated from the "old Hwa Nan" that the Communists closed and by Americans; all the teachers are volunteers. Their mission is to prepare women for the vocations that are developing as Fuzhou becomes a more open city. They preach and practice the philosophy that "A woman can do anything a man can" and "What you receive you give to others." The delegation toured Hwa Nan and learned about the school. Nancy Davis talked about overcoming mathematics anxiety.

In Guangzhou, representatives of the Intellectual Women's Association spoke about the contributions to their communities by women. The women in this city seemed to have a different attitude about professional women from the other cities in China, where the delegates heard about the progress that women had made as well as the need for more women in mathematics. Here we heard about the "new China" as opposed to the "old

China" where the men did not like women scientists or engineers. The faculty of South China Normal University compared teaching loads, course requirements and statistics about women in mathematics with the delegates. Interestingly, students seem to have more in-class instruction hours than in many U.S. universities; for example, students taking calculus meet three times per week for ninety minutes (two 45-minute sessions with a ten-minute break between the sessions) for four 20- to 22-week long semesters. Here, as at each exchange in China, Alice Schafer spoke about the AWM and women in mathematics; Frances Rosamond, about women in the MAA; and Jacqueline Dewar, about junior and senior high school programs to encourage girls to study mathematics and science.

At meetings at Peking University, at Fujian Normal, and with South China Normal University, there was a more general exchange instead of formal presentations of papers. People discussed topics of mutual interest. The groups compared the representation of women in mathematics in China and the United States and found that in each country women are underrepresented, probably more so in China. In both countries, there seems to be a fear of mathematics by the time a student reaches middle school age. Peking University students asked if American female students were considered weird by their classmates if they liked mathematics. Teaching methods were described. In China, students are not allowed to use calculators, there is limited computer time, and people do not own personal computers. In China, students learn problem-solving by studying others' solutions to problems. Students are expected to work alone but do discuss problems with each other. The curriculum is determined nationally by the Ministry of Education, but recently some flexibility has been allowed in the classroom. Members of the mathematics departments at Peking University and at South China University of Science and Engineering expressed a concern that it is harder for a woman to be placed in a job than a man because employers are afraid that a woman will not be as focused on her work once she has a baby. Yet, the head of the mathematics department of South China Normal University did not think this was a problem. The delegates were often asked why most women in the U.S. who get degrees in mathematics do not work; the delegation tried to dispell this myth. The Chinese also wondered whether working women in the U.S. have to do housework. We gave a resounding "Yes!" There were discussions about issues that sound very familiar to American working women, such as balancing the demands of career and home.

There was interest shown by the media in the presence of the delegation. The *Science and Technology Daily* in Beijing and the *Hong Kong Standard* both sent reporters to interview the delegation and then published detailed articles. In Fuzhou, there was an announcement of the delegation's arrival in the *Fujian Daily*, and a cameraman followed the delegation daily. There were stories on the morning news one day and on the evening news another day, complete with video of the group's visit. Alice Schafer was given a copy of the video, and Marymount University generously converted it to a format which will play on U.S. machines and provided a copy for each member of the delegation.

Northwest China Air provided an interesting proof not requiring division by zero of $1 = 0$. In Xi'an, boarding passes were numbered by rows starting with zero. However, on the plane, the rows were labeled 1, 1A, 2, 3, etc. Those passengers with passes labelled "zero" sat in row one; those with passes labelled "one" sat in row 1A. Thus we have shown that zero must equal one. Hotels had unusual numberings of floors. Often numbers were skipped, as in the U.S.; there was no 13th floor as well as other numbered floors in some buildings. The most striking numbering system was in the hotel in Guangzhou: there was no "1" nor "3," the first floor was "0," and the basement was "-1."

Most of the delegation's time was spent in official exchanges with people chosen to meet with us based on mutual professional interests. However, the sights seen as we travelled to meetings, the informal discussions, the questions answered by our guides, and the not-pointed out sights at tourist stops made a lasting impression on this delegate. China is definitely a study in contrasts. In many ways, people are living as if in another century without modern machines for manufacturing, farming, sanitation, construction, etc. For example, they build multi-story buildings, and the materials are delivered to the construction site by horse, donkey or person drawn cart. Lumber is hauled to jobs as logs, and the only

power tool used is a saw to make rough-cut boards; the rest of the construction work is done with handsaw and ax. Wheat is spread on the highway to be dried and crushed and then swept up with a broom at the end of the day. Beautiful crafts such as cloisonné are done by hand; workers spend hours in hot, poorly lit factories adhering small pieces of precisely bent metal on edge before layers of enamel are applied; then the pieces are sold for pennies to tourists. Handknotted oriental rugs sized 9' by 12' take four weavers working full time two years to complete. The people seemed unaware of the machines available in other countries as a result of the industrial revolution which can do much of the lifting, hauling, precise cutting, molding, etc., of materials. Daily living is much different for the college professor in China than for the college professor in the U.S. In Beijing, Xi'an and Fuzhou the average size apartment for a family ranged from 20 to 40 square meters. There were ads on TV selling the idea of buying a refrigerator in which to put food. The family vehicle is a bicycle. Local phone calls do not always go through. In Beijing, electricity is turned off for a day at a time in districts on a rotating basis because of power shortages. In this world, the intellectuals live the daily life of another era while working on contemporary problems in which their counterparts around the world are also interested. I found this impressive.

The delegation was happy with the warm welcome received everywhere in China. Our hosts were gracious, pleasant, cooperative, helpful, giving. Academic exchanges were informative and interesting. The Chinese mathematicians' mastery of English as well as their mathematical work was impressive. The delegation was very pleased to have made the trip.

Erica Voolich, Cambridge Friends School and Wheelock College

I have been a teacher in this department for five years. During my close contact with my students, I really find some problems existing among them, especially girl students. In point of intelligence and ability, these girls are *not* lower than their boy classmates *at all*, but some barriers prevent them from demonstrating their ability and getting high marks. I think these barriers are their *psychological* barriers. They *really* need our help!

As a teacher, now I have a strong hope to *remove* these barriers. Because I think these girls are very smart and diligent, and they are facing the same difficulty I met.

When I was in primary school and high school, I was fond of mathematics and always got high marks. That's why I chose this department as my field. But at the beginning of my university days, math became boring and abstract to me because of the difficulty in adapting myself to the new teaching methods. For a moment, I even got the idea of changing from the math department to another one. But later (with the help of my teachers and my mother, who is a teacher, too), it occurred to me that I should try to make the seemingly boring courses more vivid and interesting. Then I began to study math from an aesthetic point of view, and suddenly I found that the math theorems and conclusions are *so* wonderful and perfect that I was deeply attracted by them.

The title of my Bachelor's degree thesis is "Endow Mathematics with Happiness of Beauty." The thesis discusses the aesthetic values and standards of mathematics. How to direct students to the answers from the viewpoint of pursuing the beautiful unity of content and form. In fact, in scientific development, many significant discoveries were *reached* in pursuit of beauty.

Just from that time, I made up my mind to improve the methods of math education. I think for some hopeless girl students, what they eagerly need is our inspiration and guidance of method, but not *only* the math theories. Without our help, some of these girls may give up their efforts of math study.

So I think, as math teachers, our duty is *dual* — to pass on not only math knowledge but also methods of math study. Through our hard work, we dare to say we'll get some encouraging results, but more important is the encouraged students, especially girl students.

Frankly speaking, I find I am *more* interested in the research of math education than math theories.

Today, we are very happy to find that we have so many colleagues in so many famous American universities. We share the same ideas and follow after the same aims. You have brought confidence

to me and opened my eyes. Your experience and research are valuable to me. I know I still have a long way to go. I hope we will exchange information and ideas together more often.

Thank you.

speech delivered by Zhou Jia ,
instructor, Beijing Normal University

First, let me express my deep thanks and respect for your work with all my heart as a representative of our mathematics department students.

In my opinion, the situation isn't very optimistic in our department. There are several reasons. First, most of the girls think mathematics is too abstract and complicated. If they want to overtake boys, they will have to spend more times of hard work than boys will. So, it isn't equal. Second, for some girls, mathematics is dull. They think it is a waste of time to study it. Third, because our school is a normal university, most of the students will become middle school teachers. So they think it useless to get high scores if they will teach in middle school. And last, it is difficult to find a good job for mathematics department students, especially for girls, even though they are excellent in mathematics.

For me, when I was a freshman, I wished to become a post-graduate. However, with the passage of time, I found I couldn't become excellent in mathematics because I found it complicated for me and I wasn't interested in it. But I don't think girls are inferior to boys in intelligence and ability. If girls have the correct guide and if they overcome the psychological block, they will also be excellent and will be superior to boys in language and other courses.

We think highly of what you have done and what you will do. We hold the belief that all of your work will greatly improve the interest for girls to study mathematics.

Thank you again.

speech delivered by Cui Xin Mei,
student, Beijing Normal University

NRC SENIOR AND POSTDOCTORAL RESEARCH ASSOCIATESHIPS

The National Research Council announces the 1991 Resident, Cooperative, and Postdoctoral Research Associateship Programs for research in the sciences and engineering to be conducted on behalf of 30 federal agencies or research institutions whose 115 participating research laboratories are located throughout the United States. The programs provide opportunities for Ph.D. scientists and engineers of unusual promise and ability to perform research on problems largely of their own choosing yet compatible with the research interests of the sponsoring laboratory.

Awards are made for one or two years, renewable to a maximum of three years; senior applicants who have held the doctorate at least five years may request a shorter period. Annual stipends for recent Ph.D.'s for the 1991 program year range from $27,150 to $42,000, depending upon the sponsoring laboratory, and will be appropriately higher for senior Associates. Financial support is provided for allowable relocation expenses and for limited professional travel during the duration of the award. The host laboratory provides the Associate with programmatic assistance including facilities, support services, necessary equipment, and travel necessary for the conduct of the approved research program.

Applications must be postmarked no later that January 15, April 15, and August 15, 1991. Initial awards will be announced in March and April (July and November for the two later competitions) followed by awards to alternate candidates later. Information on specific research opportunities and participating federal laboratories, as well as application materials, may be obtained from: Associateship Programs (GR430/D2), Office of Scientific and Engineering Personnel, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. 20418; FAX (202) 334-2759.

NSF NEWS

Meeting Announcement

Mathematical Approaches to DNA II will be held in Santa Fe, New Mexico, March 24-29, 1991. Topics include: 1) DNA: Sequence and Map Assembly, Chair: M. Waterman; Finding Key Features in Sequence, Chair: George Bell; Data Base Searches, Chair: Eric Lander; and 2) Proteins: Analysis of Protein, Chair: Wayne Hendrickson; Folding and Stability, Chair: Fred Richards; Modeling and Simulation, Chair: David Eisenberg.

The abstract deadline is January 15, 1991. Student travel funds are available. Apply to Dr. S.J. Spengler, Prog. in Math. and Mol. Biol., 214A Stanley Hall, Univ. of Calif., Berkeley CA 94720; (415) 643-7799; sylviaj@violet.berkeley.edu or sylviaj@ucbviole.bitnet.

NSF Faculty Workshop on CAI

A workshop on computer-aided instruction will be held June 9-28, 1991, at the University of New Hampshire; project directors are Lee L. Zia and Homer Bechtell. Information and application guidelines have been sent to department chairs. Applications should be postmarked no later than March 15, 1990. Participation will be limited to thirty faculty. Direct preliminary inquiries to: CAI Workshop, Department of Mathematics, University of New Hampshire, Durham, NH 03824; (603) 862-2320; l_zia@unhh.unh.edu

NSF/ASA/NIST Research Fellowship Program

The American Statistical Association announces the ASA/NSF/NIST Senior Research Fellowship Program, 1991-92. The Program, cosponsored by the National Science Foundation and the National Institute of Standards and Technology, seeks senior researchers, advanced graduate students, or recent Ph.D.'s for 1991-92 Fellowships and Associateships at the National Institute of Standards and Technology (NIST). The Program seeks Fellows with a strong interest in collaborative cross-disciplinary research in process modeling and optimization. Possible areas of research include: statistical approaches in materials processing and bioprocessing research, on-line quality control in automated flexible manufacturing, analysis of lifetime data from multifactor experiments, sources of variability in physical measurement procedure, calibration for manufacturing process control, variance components, design of experiments, errors in variable regression, graphical data analysis, and statistical image processing.

Stipends of the Senior Research Fellows will be commensurate with qualifications and experience. Fringe benefits will be provided. Appointments will be for four to nine months. Applications are due January 15, 1991 for Fellows and February 15, 1991 for Associates.

For application information, contact Ms. Carolee Bush, ASA/NSF/NIST Research Program, American Statistical Association, 1429 Duke St., Alexandria, VA 22314-3402; (703) 684-1221. For information on research topics and other aspects of the program contact Ms. Ruth Varner, Coordinator, ASA/NSF/NIST Research Program, Statistical Engineering Division, National Institute of Standards and Technology, Admin. Bldg., Room A337, Gaithersburg, MD 20899; (301) 975-2839. Women and minorities are encouraged to apply.

Program Summary

This is a brief summary of several programs, other than the disciplinary research programs, for researchers and educators in the mathematical sciences. These programs offer opportunities for funding, ranging from equipment to postdoctoral and graduate student support, to support for women and minorities. Deadlines and contacts for more information are listed. (If a deadline is already past, keep in mind that continuing programs have similar deadlines each year.) A more detailed description of these and other opportunities is available in the brochure *Opportunities in the Mathematical Sciences.*

The five major program categories summarized here are: 1) Equipment, 2) Opportunities for Women, 3) Minority Research Initiation, 4) Postdoctoral and Graduate Fellowships and Special Awards, and 5) Research and Education at Undergraduate Institutions. Program announcements for any of these programs are available from: Forms and Publications Unit, Room 232.

1) Equipment

A) ILI: Instrumentation and Laboratory Improvement

Deadline: November 16, 1990

For innovative and effective uses of "computers" in the undergraduate curriculum; significant cost sharing from the University.

Contact: Spud Bradley, Undergraduate Science, Engineering and Math Education (USEME) (202-357-7051) or sbradley@note.nsf.gov

Laboratory Development Component: The main significance of this is that staff time, travel, etc., may be requested to develop the lab structure.

Deadline: January 25, 1991

Individuals contemplating such a proposal should call Spud Bradley (202-357-7051).

B) SCREMS: Grants for Scientific Research Equipment for the Mathematical Sciences

Deadline: December 3, 1990

For research equipment (computers), involving more than one investigator, a minimum request of $20,000, and significant cost sharing with the University. This year the program has been broadened to include, where justified and cost-effective, partial support (salary and fringe benefits) for systems administrators or programmer personnel for research computing needs. In each request for such, provision must be made by the University for substantial cost-sharing, in addition to agreeing to assume the cost permanently after a fixed, brief period.

Contact: Al Thaler athaler@note.nsf.gov

2) Opportunities for Women

A) Research Planning Grants (RPG)

Deadline: January 15, 1991

For women who have not previously served as a principal or co-principal investigator on a Federal award. These are one time awards, of capped amounts ($18,000, with a maximum overhead of 10%) and time duration (12 months, with a possible no-cost extension of 6 months). These proposals are panel reviewed.

B) Career Advancement Awards (CAA)

Deadline: January 15, 1990

For women who have an established research record and are seeking to forward their career in their current field or in a new one. Women who have had previous research support are eligible for this program. However, this is not required. These are one time awards, of a capped amount ($50,000, with a maximum overhead of 10%) and time duration (12 months). These proposals are panel reviewed.

These proposals, RPG and CAA, are in the Research Opportunities for Women (ROW) program. They differ in their write-up from regular research proposals, emphasizing the impact of the planned activity on the research, rather than the specific research. Citizenship requirements for these programs have not yet been finalized. These proposals are panel reviewed.

Contact: Peter Arzberger (202-357-3693), parzberg@note.nsf.gov or Fred Howes (202-357-3686), fhowes@note.nsf.gov

C) Research Initiation Awards (RIA)

Deadline: No specific deadline, should be submitted in October - December, each year.

For women who have not been principal/co-principal investigators on a Federal research grant. These proposals are written as regular research proposals and are handled as such.

D) FAW: Faculty Awards for Women

A five year award to women who are US citizens, nationals, or permanent residents and who are tenured, but not yet full professors. An individual must be nominated for this award.

Deadline: September 1, 1990.

1990 was the first year of competition. Eligibility and deadlines may be changed in future competitions.

E) NSF Visiting Professorships for Women

Deadline: November 15, 1990

Contact: Program Director, NSF Visiting Professorships for Women, Rm 1225, NSF, Washington, DC 20550, 202-357-7734

F) NSF-AWM Travel Grants for Women

Target Dates: November 1, February 1, May 1, August 1

Contact: Association for Women in Mathematics, Box 178, Wellesley College, Wellesley, MA 02181

3) Minority Research Initiation (MRI)

The MRI program is an integral part of the Foundation's overall effort to give greater access to scientific research for groups that are underrepresented in the science, mathematics, and engineering career pool.

A) Minority Research Initiation Awards
B) Minority Research Initiation Planning Grants
C) Research Careers for Minority Scholars

Contact: Division of Research Initiation and Improvement at NSF, 202-357-7350.

4) Postdoctoral and Graduate Fellowships and Special Awards

A) Mathematical Sciences Postdoctoral Research Fellowships

Eligibility: a) citizen or national; b) will have earned by beginning of fellowship tenure a Ph.D. (or equivalent) in one of the mathematical sciences supported by the Division of Mathematical Sciences at NSF; c) will have had the doctorate for no more than five years as of January 1 of the application year; d) will not have held any other NSF postdoctoral fellowship.

Deadline: November 15, 1990

Contact: Deborah Lockhart (202-357-7438) or msprf@nsf.gov

B) NSF Graduate Research Fellowships

Eligibility: a) citizen or national; b) at or near beginning of graduate career.

Deadline: November 9, 1990

Contact: National Research Council, Fellowship Office, 2101 Constitution Avenue, Washington, D.C., 202-334-2872

This award covers approximately three years of support. There seem to be few participants in the mathematical sciences community.

C) NSF Minority Graduate Fellowships

The program is identical to the Graduate Fellowship Program, except that only members of ethnic minority groups who are underrepresented in the Nation's science pool are eligible.

D) NATO Postdoctoral Fellowships

Eligibility: U.S. Citizenship; receipt of doctorate within the last five years.

Deadline: November 3, 1990

Contact: Division of Research Career Development, (202)-357-7536

E) Postdoctoral Fellowships at the Institutes

Each year, the institutes support a number of yearlong postdoctoral fellowships.

Institute of Mathematics and its Application (IMA)

Deadline: January 15, 1991

Visiting Membership Committee or Industrial Mathematics Postdoctorate Membership Committee, Institute of Mathematics and its Applications, University of Minnesota, 514 Vincent Hall, 206 Church Street S.E., Minneapolis, MN 55455-0436

Mathematical Sciences Research Institute (MSRI)

Deadline: November 30, 1990

Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, CA 94720

F) Graduate and Postdoctoral Fellowships in Mathematics and Molecular Biology

The Program in Mathematics and Molecular Biology has graduate and postdoctoral fellowship support available. Current topics in the Program include geometry, topology, and sequence analysis of DNA; molecular dynamics; mapping functions and algorithms for DNA and protein structure prediction. Other areas will be considered. Fellowships can be held at any U.S. university or college. Women and minorities are encouraged to apply.

Deadline: January 1, 1991

Contact: Dr. S.J. Spengler/Dr. N.R. Cozzarelli, 214 A Stanley Hall, University of California, Berkeley, CA 94720, sylviaj@violet.berkeley.edu

G) Graduate Fellowship Program in Office of Naval Research (ONR)

Deadline: January 16, 1991

Eligibility: U.S. citizens

Contact: ONR Graduate Fellowship, American Society for Engineering Education, 11 Dupont Circle, Suite 200, Washington, D.C. 20036

The Army, Air Force, and DARPA support similar programs.

H) PYI: Presidential Young Investigators

A five year award to US citizens or permanent residents, in a tenured or tenure-track position, within five years of a Ph.D. An individual must be nominated for this award.

Deadline: October 1, each year.

I) Alan T. Waterman Award

Deadline: December 31, 1990

Contact: Susan Fannoney, Executive Secretary for the Alan T. Waterman Award Committee, NSF, 202-357-7512

Eligibility: U.S. citizen or permanent resident; 35 years or younger or not more than 5 years beyond receipt of the Ph.D. degree by Dec. 31 of the year in which nominated.

Nominations for the award may be submitted by individuals, professional societies, industrial companies, and by other appropriate organizations within the scientific and educational communities.

5) Research and Education at Undergraduate Institutions

A) Research in Undergraduate Institutions (RUI)
Contact: 202-357-7456 for brochures

These proposals are submitted to the disciplinary program in DMS. RUI provides support for mathematical sciences research and research equipment for faculty in nondoctoral departments in predominantly undergraduate institutions.

B) Research Opportunity Awards (ROA)

Provides opportunities for faculty at institutions with limited research opportunities to participate in mathematical sciences research projects. Contact disciplinary program director.

C) REU: Research Experiences for Undergraduates

This involves undergraduates in active mathematics, science and engineering research experiences. Two major categories are:

REU sites (deadline: October 10, 1990; contact Jack Ryff at 202-357-3455 or jryff@note.nsf.gov)

REU supplements (contact the disciplinary program officer for support of one or two undergraduates on existing NSF research proposals)

D) Faculty Enhancement Awards

Provides support for individuals at undergraduate teaching institutions to participate in workshops or seminars to learn about new techniques and new developments in their fields.

Contact: William Haver (202-357-7051) or whaver@note.nsf.gov

E) Undergraduate Curriculum and Course Development in Engineering, Mathematics and the Sciences

To support major changes to reshape and strengthen undergraduate courses, curricula and attendant laboratories in engineering, mathematics and the sciences.

Deadline: October 15, 1990

Contact: Spud Bradley (202-357-7051), sbradley@note.nsf.gov; Bill Haver (202-357-7051), whaver@note.nsf.gov; Anne Steiner (202-357-3453), asteiner@note.nsf.gov

F) Undergraduate Curriculum Development In Mathematics: Calculus

This is a highly focused program which supports efforts to reform the calculus curriculum in ways that will result in higher success rates and increased student learning. The 1991 program will continue to support major curriculum development projects which show promise of having significant national impact, as well as to support adaptation, refinement, and implementation projects which involve approaches which have proven effective in pilot projects. The program supports projects in the entire calculus sequence, including linear algebra and differential equations.

Deadline: February 8, 1991

Contact: Spud Bradley, Room 639, 202-357-7051, jbradley@nsf.gov

G) Young Scholars

This program offers funding for enrichment activities for high-potential or high-ability secondary school students. Approximately 80 new projects in mathematics or science are funded each year.

Deadline: August 1991 (anticipated)

Contact: Virginia Eaton veaton@nsf.gov, 202-357-7538

H) Teacher Preparation And Enhancement

These programs provide support to strengthen pre-service and in-service education for mathematics teachers in grades 1-12. The programs provide excellent opportunities to strengthen the undergraduate math curriculum and to build strong relationships with schools and pre-college teachers. Projects include enhancement of both mathematical and pedagogical content knowledge.

Deadlines: October 15 and April 15 (TP), February 1 and August 1 (TE)

Contact: Joan Ferrini-Mundy (TE), 202-357-7074, jmundy@nsf.gov; Carole Lacampagne (TE) 202-357-7074, clacampa@nsf.gov; Glenda Lappan (TP) 202-357-7069; glappan@nsf.gov

Special Projects

The Foundation also funds a number of projects which do not fit into any of the specific programs. Contact: Anne Steiner (202-357-3453), Spud Bradley (202-357-7051), Bill Haver (202-357-7051).

DEADLINES: 24th of January, March, May, July, September, November
AD DEADLINES: 5th of February, April, June, August, October, December
ADDRESSES: Send all **Newsletter** material **except ads and book review material** to Anne Leggett, Dept. of Math. Sci., Loyola Univ., 6525 N. Sheridan Rd., Chicago, IL 60626; email: cantor!borel!alm@gargoyle.uchicago.edu LMA24@LUCCPUA.BITNET
Send all material regarding **book reviews** to Cathy Kessel, 2803 Parker, Apt. 2, Berkeley, CA 94704.
Send everything else, **including ads**, to Patricia N. Cross, AWM, Box 178, Wellesley College, Wellesley, MA 02181. phone: (617) 237-7517 email: PCROSS@LUCY.WELLESLEY.EDU

ADVERTISEMENTS

Academic Positions

AMERICAN UNIVERSITY. Tenure track pos. in math. Additional temp pos. in math and/or statistics may also become available. Qualifications: Ph.D. in math and evidence of strong teaching and scholarship is required. Those with exp. in actuarial science are exp. invited to apply. Responsibilities: Undergrad. and grad. teaching, scholarship, student advising, and university service. Competitive salary, commensurate with qualifications and exp. Pos. subject to final budgetary approval. Send C.V. and 3 reference names to: Prof. Robert W. Jernigan, Chair, Dept. of Math and Statistics, The American University, 4400 Mass. Ave., NW, Washington, DC 20016-8050. Pref. given to apps. received by March 1, 1991.

AMHERST COLLEGE. One-year visiting pos. in Math, preferably at the Asst. Prof. level, beg. Aug. 1991. Apps. should hold a Ph.D. in math. Submit vitae, 3 references, and transcripts from both grad. and undergrad. institutions. All apps. received by Feb. 15 assured consideration. Reply to: Prof. David A. Cox, Chair, Dept. of Math. and Computer Science, Amherst College, Amherst, MA 01002, or send electronic mail to: dacox@amherst.bitnet or dac@cs.amherst.edu.

BALL STATE UNIVERSITY. Tenure track pos. anticipated Aug. 1991. Ph.D. in pure or applied math req. Specialty is open, though pref. will be given to research interests such as differential equations, numerical analysis, computation, combinatorics or combinatorial geometry, low-dimensional or general topology. Appt. at Asst. Prof. level. Successful college or university level teaching required. Publications and/or evidence of other scholarly productivity desired. Teaching resp. may inclu. intro. classes, as well as courses related to specialty area. Salary negotiable. Send resume, 3 letters of recommendation to: Dr. Hubert J. Ludwig, Faculty Search Committee, Dept. of Math Science, Ball State University, Munci, IN 47306. Review of all apps. will begin Dec. 10, 1990 and continue until pos. filled.

BENTLEY COLLEGE, Dept. of Math Sciences anticipates at least 1 opening for tenure track pos. starting Fall 1991. Ph.D. in Math, statistics, quantitative methods, operations research or a related field is req. Salary and benefits are competitive are based on apps. scholastic and professional accomplishments. Send current resume to: Prof. Charles R. Hadlock, Chair, Dept. of Math. Sciences, Bentley College, 175 Forest Street, Waltham, MA 02154-4705.

BOWDOIN COLLEGE. Math Dept: 2 tenure track Asst. Prof. starting Fall 1991. Initial appt. for 3 eyars with renewal possible. Ph.D. req. and strong research record or potential expected. Field open, but a pref. will be given to cands. in applied math for one position. Normal teaching load is 2 courer/semester. Cands. with record of effective undergrad teaching preferred. Review of candidates begins Jan. 15, 1991, but applications will be considered until both positions are filled. Send resume, 3 letters of recommendation to: Wells Johnson, Chair, Dept. of Math., Bowdoin College, Brunswick, ME 04011.

CALIFORNIA STATE POLYTECHNIC UNIVERSITY, College of Science. Tenure track pos. in Math at the Asst. Prof. level. Salary dependent upon qualificiations. Ph.D. in math or equivalent degree. Evidence of potential for excellent teaching and scholary research required. Pref. for math modeling, history of math, algebraic geometry, or math physics. App., resume, copy of transcripts, 3 current letters of reference to be postmarked by Jan. 1, 1991 send to: Search Committee, Math Dept., California State Polytechnic Univ., 3801 W. Temple Ave., Pomona, CA 91768-4033. (714) 869-3467.

CALIFORNIA STATE UNIVERSITY, FULLERTON. Tenure track pos. at Asst./Assoc. Prof. level starting Fall 1991. Rank and salary will be determined by the qualifications of app. Cand. must have strong teaching references and evidence of a commitment to continuing research in Numerical Analysis, Discrete

Mathematics, or Partial Differential Equations. Send letter of application, curriculum vitae, 3 references letters to: Chair of the Selection Committee, Dept. of Math., California State University, Fullerton, Fullerton, CA 92634 by Feb. 18, 1991.

CALIFORNIA STATE UNIVERSITY, LOS ANGELES Dept. of Math and Computer Science invites apps. for 2 tenure track pos. at Asst. or Assoc. level for a starting date of late June or Sept. 1991. Our main areas of interest are geometry, combinatorics, and math education. Ph.D. required (ABD in math education will be considered). Considerations will begin Feb. 1, 1991. Send inquiries to: Marshall Cates, Chair, Dept. of Math and Computer Science, California State University of Los Angeles, 5151 State Univ. Dr., Los Angeles, CA 90032.

CALIFORNIA STATE UNIVERSITY, NORTHRIDGE. Two tenure track pos. at Asst. Prof. level for Fall 1991. Will consider cands. from areas of algebra, analysis, topology, applied math or math physics. Req. incl. Ph.D by Fall 1991, demonstrated record or potential in research, and strong commitment to teaching. Resp. incl. teaching 9 to 12 hrs., depending on research and/or other contributions. Send vitae, 3 letters of recommendation to: Mary Rosen, Hiring Committee Chair, Dept. of Math, California State Univ., Northridge, Northridge, CA 91330 by Feb. 15, 1991.

CALIFORNIA STATE UNIVERSITY, SACRAMENTO. Dept. of Math and Statistics. One tenure track pos. (Asst. or Assoc. Prof.) for Fall 1991, at a step appropriate to the applicant's experience. Must have Ph.D. in math or statistics by Sept. 1, 1991. Salary range begins at $33,192. Applicants should be committed to excellence in teaching (12 units/semester) and must have some background and a willingness to work in the area of elementary and secondary teacher preparation. Send vitae, graduate transcipts, 3 letters of recommendation (1 commenting on teaching ability), by Jan 31, 1991 to: Hiring Committee, Math and Stat. Dept., California State Univ., Sacramento, Sacramento, CA 95819-6051.

CALIFORNIA STATE UNIVERSITY, SAN BERNARDINO. Apps. are being accepted for pos. of Asst. or Assoc. Prof. (tenure track); Ph.D. in math education with at least a BA in math is req. Successful cands. will be expected to teach 12 hrs. per week, participate in scholarly activities, and help implement a new MAT program. Current salary range is $30,276 to $52,896 dependent upon qual. and exp. Apps. should submit letter of app., vitae, 3 letters of recommendation and all transcripts by Feb. 1, 1991 to Dr. John Sarli, Chair, Dept. of Math., California State University, 5500 University Parkway, San Bernardino, CA 92407.

CALIFORNIA STATE UNIVERSITY, SAN MARCOS. Seeking a Ph.D. mathematician in either mathematical analysis or numerical math for tenure track Asst./Assoc. Prof. pos. beginning Aug. 1991. Must have strong academic and professional preparation and with interests in the development of the math sciences at a brand new institution. App. should consist of statement of interest, 3 reference letters commenting on applicant's credentials in teaching, research and service. Copies of scholary work may be included. Opening pending authorization. Send to: Mathematics Search Committee, California State Univ, San Marcos, 820 W. Los Vallecitos Blvd., San Marcos, CA 92069-1477. Review of cands. will begin Jan. 15, 1991.

CALVIN COLLEGE. Dept. of Math and Comp. Science expects to have tenure track pos. open for 1991-92 academic year. Interest in math education or statistics is preferred, but other specialties will be considered. To apply, send vitae to: Prof. G. Venema, Chair, Dept. of Math. and Comp. Science, Calvin College, Grand Rapids, MI 49546.

CARLETON COLLEGE. Dept. of Math. and Comp. Science has 1, possibly 2, 2-year non-tenure track positions beg. Sept. 1991, with possibility of renewal. Ph.D. req. (apps. whose Ph.D. will be all but complete may be considered.) Teach 6 courses/year in math., comp. science and/or statistics. Pref. given to individuals who can teach in two of these areas. Excellent teaching skills essential. Deadline Feb. 15, apps. accepted until pos. are filled. Send letter of app., resume, graduate transcript(s) and 3 recent letters of reference to Jack Gold feather, Chair, Dept. of Math. and Comp. Science, Carleton College, 1 North College St., Northfield, MN 55057-4025. Computing resources available to dept. members incl. 12 NeXT's, 3 Mac II's, a DEC Micro VAX II running Untrix, a Raster Tech 3/85 graphics workstation, several Transputer-equipped parallel processing workstations, and a variety of microcomputers.

CASE WESTERN RESERVE UNIVERSITY. Tenure track pos., possibly senior, in applied statistics will be available in the Summer 1991. Outstanding research record or proven research potential and teaching excellence is req. Initial appts. will be in Dept. of Math. and Statistics. Since the Univ. has made the reestablishment of Statistics a priority for future development, it is expected that these positions will eventually be in an independent Statistics Dept. Send vitae plus 3 letters of recommendation to: Dr. C.A.

Cullis, Dean, Faculty of Mathematics and Natural Sciences, Crawford Hall, Case Western Reserve University, Cleveland, OH 44106.

CENTRAL MICHIGAN UNIVERSITY. 3 tenure track pos. and 1 tentative tenure track pos. All are at Asst. Prof. rank. Priorities for the 3 indicated positions are: functional analysis/operator theory, combinatorics/design theory, and math education. The tentative pos. is in stat. and its status will be determined by Jan. 1991. Stat cands. may also be considered as a 4th priority for 1 of the 3 positions mentioned above. Cands. for all positions should have a Ph.D in the appropriate field of math, show promise of excellence in teaching, and have demonstrated research ability. Cands in math education should have teaching exp. in K-12 and the ability to teach undergrad math courses. Duties incl. teaching and research with a normal teaching load of 9 semester hrs. Pref. will be given to cands. who complement existing research interests in the Dept. Salaries are competitive and benefits incl university-paid TIAA, medical, dental, group life. Send resume, transcripts, 3 letters of recommendation to: R.J. Fleming, Dept. of Math. Central Michigan Univ., Mt. Pleasant, MI 48859 by Jan 21, 1991, or until pos. are filled.

CLEVELAND STATE UNIVERSITY, Department of Mathematics, Department Chair: Applications and nominations are invited for the position of Department Chair starting Summer 1991. Candidates should have an outstanding research record and a commitment to excellent teaching. The Department has 27 full-time faculty and offers two baccalaureate and two master's degrees. Please send vita, reprints/preprints, and at least four letters of recommendation to the Chair Search Committee, Department of Mathematics, Cleveland State University. Cleveland, OH 44115.

CLEVELAND STATE UNIVERSITY, Department of Mathematics, Anticipated Opening for Assistant Professor: Applications are invited for the anticipated position of tenure-track Assistant Professor starting September 1991. Candidates should have a strong research record and a commitment to excellent teaching. Research areas compatible with those in the Department are preferred. Send vita, reprints/preprints and three letters of recommendation to John Chao, Department of Mathematics, Cleveland State University, Cleveland, OH 44115.

COLBY COLLEGE. Appointing up to 2 Clare Boothe Luce Asst./Assoc. Prof. to tenure track pos. in Math/Computer Science. The Luce Chairs are appointed at the upper end of the College's salary scale for their rank and are provided with additional travel, research, and equipment funds. Send a letter of inquiry, a current CV, 3 reference letters to: Colby College, Waterville, ME 04901. FAX (207) 872-3555.

COLLEGE OF CHARLESTON. Math. Dept. At least 2 tenure track positions at the Asst. Prof. level available Fall 1991. Qualifications: Ph.D. in one of the math sciences, commitment to undergrad. teaching and potential for continuing research. Teaching: 9 hrs./wk. normal load for those engaged in research. Salary is competitive. Send resume and have 3 reference letters to: W.L. Golightly, Chairman, Math. Dept. College of Charleston, Charleston, SC 29424.

DARTMOUTH COLLEGE. John Wesley Young Research Instructorship, 2- yrs., new or recent Ph.D. whose research overlaps dept. member's. Teach 4, 10-week courses spread over 2 or 3 quarters. $32,500; $7,150 summer research stipend. Send app. letter, resume, research/thesis description, grad transcript, 3 (prefer 4) references (1 discussing teaching) to: Phyllis A. Bellmore, Dept. of Math and CS, Dartmouth College, Hanover, NH 03755. Files complete Jan. 15.

DARTMOUTH COLLEGE. Tenure track Asst. Prof. in Math, initial appt. in 91-92 academic year. Teaching 4, 10-week courses over 2-3 terms. Strong research required. All fields of math. incl. stat. Send letter of appl, vitae, research interest, 4 recommendations (at least 1 on teaching) to: Phyllis Bellmore, Dept. of Math and CS, Dartmouth College, Hanover, NH 03755. Apps. due by Feb. 1.

DEPAUL UNIVERSITY. Math Dept. Tenure track pos. at Asst. Prof. level beg. Sept. 1991. Ph.D. in Math req. Will consider strong cands. in any field of research. Apps. should send a c.v. and 3 or more letters of recommendation, at least 1 pertaining to teaching, to: Hiring Committee, Dept. of Math., 2219 N. Kenmore, Chicago, IL 60614.

EASTERN ILLINOIS UNIVERSITY, Dept. of Math. A tenure track pos. starting Fall 1991 is anticipated. Ph.D. in math or math sciences (incl. appl. math, computing, math ed, or stat.) is required. Excellence in teaching is expected and potential for scholarly activities is desired. Rank is open. Full consideration given to apps. received by Jan. 1, 1991. Send to: Ira Rosenholtz, Chairperson, Dept. of Math, Eastern Illinois Univ., Charleston, IL 61920.

GEORGIA STATE UNIVERSITY. Dept. of Math & Comp Sci. Univ. Plaza, Atlanta, GA 30303-3083. Anticipated tenure track Asst. Prof. pos. 9/91 Rank and salary commensurate with qualificaitons and exp.

Qualifications: Ph.D. in math with strong res. potential and commitment to teaching. Pref. is for graph theory or analysis; or Ph.D. with strong res. potential in & commitment to teaching in computer science. Prefer applicants in all reas of comp sci, but especially in artificial intelligence, operating systems, data communications, networking & computer graphics. Duties: teaching, res & service to support BS & MS degrees in math & comp sci. Send letter of application, and vita without birthdate but with citizenship status, and 3 letters of reference & transcripts of all undergraduate and graduate work to Chmn at above address. Applications accepted until position is filled.

HAMILTON COLLEGE. Dept. of Math. Two-year tenure track pos. Ph.D. and prior teaching exp. desirable. Duties involve teaching 5 courses/yr. Send c.v. and 3 letters of recommendation (1 about teaching), to: Richard Bedient, Chair., Dept. of Math. and Comp. Science, Hamilton College, Clinton, NY 13323. (315) 859-4138.

HOBART AND WILLIAM SMITH COLLEGES, Dept. of Math and Computer Science. Two Asst. Prof., tenure track pos. starting Sept. 1991. Salary is competitive. For first pos., apps. should have Ph.D. in computer science or Ph.D. in math and experience in computer sci. Duties incl. teaching undergrad. computer sci., participating in the College's Interdisciplinary General Curriculum, and the possibility of teaching some math (depending on interests and qualifications). The second pos., apps. should have. Ph.D. in math, specialty open, but pref. may be given to algebraists, applied mathematicians, or those with demonstrated computer sci. expertise. Duties incl. teaching udnergrad math, participating in the College's Interdisciplinary General Curriculum, and the possibility of teaching some computer science (depending on interests and qualificiations). For both pos., commitment to teaching and promist of continued scholarly activity is req. Teaching load: 2 courses/trimester. Send resume, 3 letters of recommendation (at least 1 on teaching) and undergrad and grad transcripts, to: Prof. Kevin Mitchell, Faculty Box 75, Dept. of Math and CS, Hobart and William Smith Colleges, Geneva, NY 14456. Deadline Dec. 15, 1990 or until pos. filled.

HUMBOLDT STATE UNIVERSITY. Apps. are invited for a tenure track Asst/Assoc prof. pos. for Fall 1991. Cands. must have Ph.D. in math sci. or math education. All qualified applicants with a commitment to teaching excellence and professional activities will be considered. Pref. will be given to apps. with teaching credentials and/or teaching exp. in elementary or secondary schools. Send vitae, transcripts, 3 letters of reference to: Math Education Search Committee, Dept. of Math, Humboldt State Univ. Arcata, CA 95521 by Feb. 1. 1991.

ILLINOIS STATE UNIVERSITY., Math Dept. Tenure track pos. in math at Asst. or Assoc. Prof. level. Apps. should have Ph.D by Aug. 1991; research interest in areas of applied probability, combinatorial optimization, graph theory, operations research, or statistics; and a strong research record or potential. Cands. should also have sufficient background to teach a variety of undergrad. math courses, and be committed to quality teaching. To apply send c.v., 3 letters of recommendation, and official transcripts by Feb. 1, 1991 to: Dr. Jane O. Swafford, Dept. of Math, Illinois State University, Normal, IL 61761.

INDIANA STATE UNIVERSITY. Dept. of Math. and Computer Science. Applications for the position of Chairperson. Apps. should have a Ph.D. in Math. or Computer Science, a record of successful teaching, and other scholarly activities. Apps. should also possess the leadership skills necessary to chair a large dept. which has diverse teaching and research resp. The Computer Science area is undergoing active development, so familiarity with Computer Science curricula issues is desirable. Salary and rank are commensurate with qualifications and exp. Send letter of app. and vitae, and 3 letters of recommendation to: Chairperson Search Committee, Dept. of Math. and Computer Science, Indiana State University, Terre Haute, IN 47809. Deadline is Feb. 1. 1991. Apps. received after that date cannot be guaranteed consideration. U.S. citizenship or eligibility for U.S. employment will be required.

INDIANA STATE UNIVERSITY, Dept. of Math. One or more tenure track pos. starting in Fall 1991-92. Dept. is especially interested in applicants with doctoral degrees in Statistics or Computer Science, but all specialties are encouraged to apply. Send letter of application, vitae, 3 letters of reference to: Chairperson, Dept. of Math. and Computer Science, Indiana State University, Terre Haute, IN 47809.

INDIANA UNIVERSITY OF PENNSYLVANIA, Math. Dept. Tenure track pos. at Asst. Prof. level beginning Fall 1991. Resp.: To teach undergrad. and grad. courses with emphasis on courses in Operations Research. Provide leadership in the implementation of a newly designed and approved MS program in Applied Math. with emphasis in Operations Research and Applied Statistics. Give direction to a grad. internship pgm. and to grad. student projects in Applied Math. Help establish an academic and professional relationship between the grad. pgm. at IUP and local and regional business/industrial organizations. Qualifications: Ph.D. in either Operations Research or Applied Math. Teaching and/or field exp. preferred but not required. Review of apps. will begin Jan. 2, 1991 and continue until pos. filled. Send letter of app.

resume, undergrad. and grad. transcripts, and 3 letters of reference to: Search Committee A, Math. Dept., Indiana Univ. of Penn., Indiana, PA 15705. (412) 357-2608. (BITNET:FWMORGAN@IUP).

INDIANA UNIVERSITY OF PENNSYLVANIA, Dept. of Math, College of Natural Sciences and Math, invites apps for a tenure track position in the math dept. at Asst. Prof. level beginning Fall 1991. Resp: Teach undergrad and grad. courses and advise students. Primary teaching resp. incl. math contents, methods of teaching and curriculum for elementary and middle school teachers; participate in continuing scholary activity; participate in university, college, and dept. committees. Qualifications: Ph.D./Ed.D. by Sept. 1991 in area of math ed. Evidence of effective teaching experience in math at K-8 level. Academic preparation and evidence of ability to teach basic college math. Evidence of successful research or research promise in math ed. Pref. candidate with successful research in math ed. at K-8 level, active membership in recognized professional organizations, eveidence of grad course work in K-8 ed., experience with in-service presentations and/or curriculum consultation at the school district level. Salary commensurate with exp. Excellent fringe benefits. Review of apps. begins 1/15/91 until pos. is filled. Send letter of app., resume, undergrad and grad transcripts, 3 current letters of reference to: Search Committee E, Math Dept., Indiana University of Pennsylvania, Indiana, PA 15705

IOWA STATE UNIVERSITY, Dept. of Math, invites apps. to fill 3 tenure track pos. for 1991-92 academic year. Start up funds will be available for the successful app. for each pos. The areas of interest and level are a senior pos. in numerical analysis or computational math, an entry level pos. in control theory, and an entry level in math education. The successful cand. for each pos. is expected to have a strong interest in teaching at both the grad and undergrad level and maintain an active research program in his/her chosen area. In addition, cands. for the senior pos. are expected to have a strong research record, be willing to build a strong research group in numerical analysis or computational math, to interact with colleagues in related areas, and to seek outside funds for their research. Screening begins Dec. 15, 1990 and will continue until pos. are filled. Apps., and 3 letters of recommendation should be sent to: Howard A. Levine, Chair, Dept. of Math, Iowa State Univ., Ames, IA 50011.

JOHNS HOPKINS UNIVERSITY, Dept. of Math. Apps. invited for pos. at all levels in fields of interest to the dept. Two of the pos. represent part of the Dept. commitment to increase its representation in analysis. Areas of particular interest are partial differential equations, and geomteric analysis. Outstanding research accomplishments and commitment to teaching are req. Apps. should be send to: Search Committee, Dept. of Math, The Johns Hopkins University, Baltimore, MD 21218. Apps. in stat & probability, operations research & optimization, discrete math, matrix analysis and numerical analysis should contact the Dept. of Math Sci. which is distinct from Dept. of Math.

KANSAS STATE UNIVERSITY, Dept. of Math. Several tenure track and visiting pos. commencing Aug. 18, 1991; rank and salary commensurate with qualifications. all fields will be considered, but for tenure track pos. pref. will be given to cands. in Numerical Analysis, Partial Differential Equations, Global Analysis, and Geometric Topology (esp. Low-Dimensional). Apps. must have strong research credentials and a commitment to excellence in teaching. Require Ph.D. in math. or an accepted Ph.D. dissertation with only formalities to be completed. Send letter of app., current vitae, description of research, and 3 letters of reference to: Louis Pigno, Dept. of Math., Cardwell Hall 137, Kansas State Univ., Manhattan, KS 66506.

KNOX COLLEGE, Dept. of Math and CS. Tenure track pos. at the Asst. Prof. level beginning Sept. 1991. Cands. must have Ph.D in math and a commitment to excellence in teaching and continued scholarly development. Ability to teach a broad range of dept. offerings is desirable. All fields considered; some pref. for topology or geometry. Salary is competitive. Teaching load is 2 course/term for each of 3 terms. Send letter of app., resume, graduate transcript, and 3 letters of recommendation to: Dennis M. Schneider, Chair, Knox College, Dept. of Math and CS, Galesburg, IL 61401.

LEHMAN COLLEGE, Math Dept. Tenure track pos. in math. or computer sci. Cands. must have Ph.D. with several years of post-doc. exp., a strong commitment to teaching and an outstanding research record in Math. or Computer Sci. Rank and salary commensurate with qualifications and exp. Send resume and names of 3 references to: Prof. Robert Feinerman, Chairman, Dept. of Math. and Computer Science, Lehman College, Bronx, NY 10468.

MASS. INSTITUTE OF TECHNOLOGY. Sloan School of Management. Apps. for pos. in the Statistics group of the School of Management at MIT. Successful cands. need to exhibit excellence in research and to demonstrate an ability to teach in our Master's and Doctoral programs. Depending on qualification, this pos. may be tenure track or tenured. Seeking a statistician with interests in theory, applications, and computing who could interact successfully with Sloan School faculty in areas such as operations mgmt. (quality and experimental design), finance, organizational behavior, and marketing. Apps. must have

Ph.D. or prospects of completion by June 1991. Send resume (with 3 reference letters) and samples of research to: Prof. Roy E. Welsch, Sloan School of Mgmt., MIT, E53-383, Cambridge, MA 02139.

MIT, C.L.E. Moore Instructorships in Mathematics. Open to mathematicians with Ph.D. who show definite promise in research. Teaching loads are 6/hrs. per week 1 semester, 3/hrs. week the other, or other combinations totalling 9 hrs. Appts. are for 1 year, renewable for 1 additional year. Please send vitae, description of research in your thesis, research which you plan for next year to: Dept. of Math, MIT, Room 2-263, Cambridge, MA 02139.

MIT. A limited number of Applied Mathematics Instructorships are available for recent Ph.D. of any age. Appts. will be made on the basis of superior research potential for a period not exceeding two years. App. are considered and final decisions announced on or before Mar. 15, 1991. For further info. write to: Committee on Applied Mathematics, Room 2- 345, MIT, Cambridge, MA 02139.

MIT. Dept. of Math may make several appts. at the Asst. Prof. level for the 1991-92 year. These appts. will be for 3 years, and the teaching load will be 6 hrs. per week in one semester and 3 hrs. per week in the other, or other combinations totalling 9 hrs. Open to mathematicians with doctorates who show definite promise in research. Apps. send vitae, description of your research, your research plans for next year to: Pure Math Committee, Room 2-263, or Applied Math Committee, Room 20345, Dept. of Math, MIT, Cambridge, MA 02139 .

MEMPHIS STATE UNIVERSITY. Dept. of Math. Sciences taking apps. for one tenure track pos. each in De/Applied Math. and Statistics at the Asst./Assoc. Prof. level. Current areas of research in De/Applied Math. include nonlinear boundary value pbms., functional differential equations, dynamical systems and math. modeling. In Statistics, current areas of research incl. applied statistics, biostatistics, survival analysis, risk assessment, stochastic modeling and statistical computing. Apps. must have a have a Ph.D. by Sept. 1, 1991 and a strong potential for excellence in teaching and research. Selection begins Jan. 31, 1991. Apps. will continue to be accepted until all pos. are filled. Successful cands. must meet Immigration Reform Act criteria of 1986. Submit resume and 3 letters of reference to: Cecil C. Rousseau, Interim Chair, Dept. of Math Sciences, Memphis State University, Memphis, TN 38152.

MEXICO STATE UNIVERSITY. Dept. of Mathematical Sciences, Las Cruces, NM 88003.. The Dept. invites apps for several visiting and tenure track positions for Fall 91. Tenure track positions are primarily at the asst. prof level but under very specific circumstances, appts. at higher rank may be possible. Strong commitment to research and teaching required. Pref. given to apps whose research interests relate to strengths in the Dept. New Mexico State meets federal criteria for classification as a minority institution. Apps are kept on file thru hiring period and positions filled as openings occur. Arrange for vita, short research description, and at least 3 letters of ref to be sent to: Hiring Committee, Dept. of Math Sci, New Mexico State University, Las Cruces, NM 88003.

MICHIGAN STATE UNIVERSITY, Dept. of Math. One or more postdoc fellowships in Math. The appt. is for 2 years. Duties incl. teaching 1 course each term of the academic year with the expectation that the fellow will devote the remaining time to research. These fellowships are normally offered to persons (regardless of age) who have had their doctorate less than 2 years. There will be some instructor pos. available also. Please send resume, 3 letters of recommendation to: Prof. Jacob Plotkin, Interim Chair, Dept. of Math, Michigan State Univ., East Lansing, MI 48824-1027. Apps. in by Jan. 4, 1991 will be given full attention.

MICHIGAN STATE UNIVERSITY, Dept. of Math. Several open tenure track pos. at the Asst/Assoc. and possibly full Prof. levels in all fields. Excellence in research and teaching is essential. Please send resume, 3 letters of recommendation to: Prof. Jacob Plotkin, Interim Chair, Dept. of Math, Michigan State Univ., East Lansing, MI 48824-1027. Apps. due by Jan. 4, 1991.

MICHIGAN TECHNOLOGICAL UNIVERSITY. Tenure track pos. at asst./assoc. level in Applied Math. beginning Sept. 3, 1991. Areas of special interest incl. fluid mechanics, math. modeling, computational math. and partial differential equations. Appts. at non-entry level require substantial record of published research. Req. incl. Ph.D. in Math., excellence in research or potential for such, as well as commitment to teaching at undergrad. and grad. level. Send letter of app., resume, 3 letters of recommendation to: Recruitment Committee, Dept. of Math. Statistics, Michigan Technological Univ., 1400 Townsend Dr., Houghton, MI 49931- 1295. Deadline: Feb. 15, 1991.

MICHIGAN TECHNOLOGICAL UNIVERSITY. Dept. of Math. Sciences Has several Visiting Asst. Prof. pos. available for 1991-92 academic year. Selection based on teaching credentials, as well as contributions to

the research effort of dept. Send letter of app., resume, 3 letters of recommendation to: Recruitment Committee, Dept. of Math. Sciences, Michigan Tech., 1400 Townsend Dr., Houghton, MI 49931-1295.

MONTCLAIR STATE COLLEGE, Dept of Math and Computer Science. Two tenure track pos. in math. education at Asst. Prof. rank. Cands. expected to have a commitment to teaching and to participate in ciurriculum development. Teaching load is 12 credits per sem. Apps. should have doctorate in math ed. or math: (1) Math Ed. V12; teach undergrad math and grad math ed courses. Expertise in jr. and sr. h.s. math curriculum and current software are req. Supervisory Exp. pref. (2) Math Ed. V13; teach primarily undergrad math. Expertise in remedial/developmental math ed programs at the college and secondary level; interest in elementary math pref. Submit resume, with appropriate V number and names, addresses and phone numbers of 3 references to: Kenneth C. Wolff, Dept. of Math and CS, Montclair State Univ., Upper Montclair, NJ 07043. Screening begins Feb 4, 1991 and continues until pos. are filled.

MONTCLAIR STATE COLLEGE, Dept. of Math and CS invites apps. for pos. in math. 1 tenure track pos in applied math at Asst. Prof. rank other pos. is non-tenure, 1-yr. ohnly appt. in math at instructor rank. Teaching load is 12 credit/sem. Apps. must have commitment to quality teaching. Pos. are: (1) Applied Math V11; expertise in operations research math modeling, discrete and continuous applied math. Exp. in pbm. solving on computer. Teach applied math courses at undergrad and grad master's level. Cands are expected to pursue grant, be active as both a scholar and with professional organizations. Ph.D. in math required. Tenure track pos. (2) Math V14; apps. will teach a general range of undergrad math courses incl. liberal arts students. MA/MS or Ph.D. in math plus teaching exp. Non-tenure track pos. Submit resume with V number and names, addresses, phone nunbers of 3 references to: Dr. Kenneth C. Wolff, Dept. of Math and CS. Montclair State College, Upper Montclair, NJ 07043. Screening begins Feb. 4, and continues until pos. are filled. Starting date is Sept. 1, 1991.

NORTHWESTERN UNIVERSITY, Dept. of Math. Have one or more tenure pos. available starting Sept. 1991. Although priority will be given to young, exceptional research mathematicians (no more than several years after Ph.D.), more senior candidates with very exceptional credentials may be considered for a tenured pos. Fields of interest of the dept. incl. Algebra, Analysis, Dynamical Systems, Probability, Partial Differential Equations, and Topology. Cands. should arrange at least 3 letters of recommendation be sent to Chair, Personnel Committee, Dept. of Math., Northwestern Univ., Evanston, IL 60208. Apps. should arrive no later than Feb. 15, 1991. Hiring is contingent upon eligibility to work in the U.S.

NORTHWESTERN UNIVERSITY, Math. Dept. Will sponsor an Emphasis Year in algebraic topology, cohomology of groups, and related topics. Program will incl. 2-year Asst. Prof. pos. starting Sept. 1991 and possible visiting pos. for more senior mathematicians for part or all of the academic year. Send apps., c.v. and 3 letters of recommendation by Feb. 15, 1991 to: Prof. Mark E. Mahowald, Northwestern Univ., Evanston, IL 60208.

OAKLAND UNIVERSITY. Dept. of Math. Sciences invites apps. for tenure track position at rank of Asst./Assoc. Prof. in area of applied sciences. Resp. incl. teaching 2 courses per semester. A number of statistics classes are offered for the auto industry on location and consulting with auto industry is possible. Scholarly research and publication are required. Pref. will be given to apps. with background in reliability, warranty forecasting, time series, robust procedures, or experimental design. Please send vitae and 3 reference letters to: Dr. Darrell Schmidt, Acting Chair, Dept. of Math. Sciences, Oakland University, Rochester, MI 48309-4401. Review of vitae will begin Jan. 15, 1991, and will continue until position is filled.

OCCIDENTAL COLLEGE. Tenure track pos. in Dept. of Math. at Asst. or Assoc. Prof. level. Pref. will be given to applicants with exp. and expertise in applied math. sciences, incl. differential equations, numerical analysis, applied statistics, and computer science. Excellence in teaching and substantial professional achievement are the major expectations. Normal teaching schedule is 2 courses during each of 3 10-week terms; new faculty members are released from 1 course during the initial year. Each faculty member receives a sabbatical term every 3 years; some institutional support for extended leaves avail. Salary is competitive. An excellent benefits package incl. choice of health care plans, tuition grants for children of faculty, and a mortgage subsidy pgm. Send apps., resume, statement of professional goals, 3 letters of reference (at least 1 evaluating teaching performance and potential) to: Faculty Search Committee, Dept. of Math., Occidental College, Los, Angeles, CA 90041. All apps. should be received by Feb. 16, 1991.

POMONA COLLEGE. Tenure track asst. prof., preferably with postdoctoral experience. Excellent candidates from all fields of math will be seriously considered, but pref given to applied math. Pomona College, a highly selective liberal arts college with intellectually gifted students, is one of the Claremont Colleges, which together provide an active professional community of over 30 mathematicians, an

excellent research library, weekly Mathematics Colloquia, research seminars, and clinics in applied math. Looking for someone who can continue Pomona's tradition of excellent and innovative teaching and who will actively participate in the mathematical life of the Claremont Colleges. Apps sent to: The Search Committee, Dept. of Math., Pomona College, Claremont, CA 91711-6348. Apps received by 1/31/91 will be given full consideration. Apps must include vita and letters of rec, inc letters evaluating teaching, grad school transcripts, and a description, written for the nonspecialist, of research accomplishments and plans. Please let us know if you will be attending the AMS meeting in San Francisco.

PURDUE UNIVERSITY CALUMUT. Dept. of Math, Computer Science & Statistics expects to have 2 tenure track pos. available for Aug. 1991. Both will be at Asst. Prof. rank. Both pos. req. demonstrated teaching ability and research potential. They are: Math Ed; req. Ph.D. in math with exp. in the pre-service ed of elementary and secondary school teachers, or a doctorate in math education with a maters in math. Resp. will incl. undergrad and grad teaching, research, and curriculum development and oversight. Send letter of appl, c.v., grad and undergrad transcripts, 3 reference letters (at least 1 applying to teaching) to: Prof. J. Paul McLaughlin, Dept. of Math, C.S. & Stat., Purdue Univ. Calumut., Hammond, IN 46323. Mathematics; req. Ph.D. in math. Resp. incl. undergrad and grad teaching, research, and curriculum development. Submit app., c.v., 3 references (1 addressing teaching ability) to: Prof. Ronald J. Wagenblast, Dept. of Math, CS & Stat, Purdue Univ. Calmut, Hammond, IN. Apps. received by Feb. 1, 1991 will be considered first.

RICE UNIVERSITY. Griffith Conrad Evans Instructorships. Post-doc. appts. for 2-3 years for promising research mathematicians with research interests in common with the active research areas at Rice. Send inquiries to: Chair, Evans Committee, Dept. of Math., Rice University, P.O. Box 1892, Houston, TX 77251-1892.

RICE UNIVERSITY. Dept. of Math. Apps. for tenure track Asst. Prof. pos. Possibility of upgrade to Assoc. or Full Prof. for an exceptional senior cand. Candidates must have an extremely strong research background and good teaching skills. Pref. given to apps. in low-dimensional topology, although outstanding cands. in analysis, geometry, and topology will also be considered. Send c.v. and at least 3 letters of recommendation to: Appointments Committee, Dept. of Math., Rice University, P.O. Box 1892, Houston, TX 77251.

ST. MARY'S COLLEGE OF MINNESOTA. Dept. of Math. & Statistics invites applications for Dept. Chair. 9-month, tenure track position to lead a 7-member dept., starting 8/91. PhD. in math. or statistics is required, as well as demonstrated excellence in teaching and communication at the undergrad. level, and experience or potential for departmetnal administration. Review began Dec. 1 and continues until position is filled. Send vitae and 3 reference names and addresses to: Louis A. Guillou, Campus Box 4, St. Mary's College of Minnesosa, Winona, MN 55987.

SOUTHWEST MISSOURI STATE UNIVERSITY One or more tenure track and/or visiting positions in Mathematics and Statistics, beginning Fall, 1991. Rank and salary will be commensurate with qualifications. Applicants must have a PhD in Mathematics or Statistics, evidence of excellence in teaching, and a commitment to continued research. For all positions preference given to applicants with research interests compatible with those of the current faculty. Duties include teaching, research, and service. Applications will be reviewed as received and will be accepted until the positions are filled or until February 15, 1991 - the final deadline for all application materials. Send vita and graduate transcripts, and have three letters of reference sent to: Clayton Sherman, Acting Head, Dept. of Mathematics, Southwest Missouri State University, Springfield, MO 65804-0094. AA/EOE SYRACUSE UNIVERSITY. Department of Mathematics. Box 1, Syracuse, New York. Candidates should have outstanding research ability and evidence of excellence in teaching. Applications are invited in any area of mathematics and in mathematics education and statistics. Send a letter of application and vita with a list of publications, and have three letters of recommendation sent to Daniel Waterman, Chair.

SANGAMON STATE UNIVERSITY. Anticipated tenure-track position, asst. or assoc. prof. in math starting 8/15/91. A Ph.D. in math with teaching experience is preferred; ABD will be considered. Duties include teaching a wide range of junior/senior/master's level math (12 hrs./week) and other responsibilities of full-time faculty. Rank and salary are dependent on qualificiations and experience. Send transcripts, vitae, 3 letters of reference to Mathematics Search Committee, Mathematical Sciences, Sangamon State University, Springfield, IL 62794-9243. Review of apps. begins 2/15/91.

STATE UNIVERSITY OF NEW YORK AT CORTLAND. Mathematics Dept., Cortland, NY 13045. Apps. are invited for a tenure track pos. in math at the Asst. prof. level beginning 8/91. Duties include teaching math courses from the elementary to the upper division level (4 classes/3 preparations). A doctorate in math and evidence of strength in, and commitment to undergrad education is required. An interest in the

preparation of secondary math teachers will be valued, as well as research potential in math or math education. Please send credentials to Prof. Kenneth Wooster, Dept. of Math., P.O. Box 2000, Cortland, NY 13045.

TEXAS CHRISTIAN UNIVERSITY, M.J. Neeley School of Business. Tenure track pos. for Asst. Prof. of Decision Sciences beginning Aug. 15, 1991. Responsibilities incl. undergrad. and MBA courses in statistics (intro. stat., regression analysis, experimental design, forecasting and quality control) with possibly secondary resp. in mgmt. science and production mgmt. Qualifications: Ph.D. or equivalent, in Statistics or in a related area such as Mgmt. Science or Production Mgmt. Cands. who will complete their Ph.D. by beginning of employment will be considered. Evidence of teaching effectiveness and strong research potential is required. Cands. must be able to communicate clearly both orally and in writing. Relevant professional exp. is desirable. App. screening begins Nov. 1, 1990. Send resumes to: Prof. Dan W. French, The Neeley School, Texas Christian University, Fort Worth, TX 76129.

TOWSEN STATE UNIVERSITY, Math Dept. Tenure track asst. or assoc. prof. in math. education available Fall 1991, contingent on state funding. Teach 12 hrs./semester of undergrad. courses. A Ph.D. in Math. education and a commitment to teaching and reasearch are required. Pref. will be given to apps. with 3 years teaching/research exp. in elementary and/or early childhood education. Send resume. 3 letters of recommendation and transcripts by Feb. 15, 1991, to Robert Hanson, Chairperson, Search committee, Mathematics Dept., Towson State University, Baltimore, MD 21204.

TRENTON STATE COLLEGE, Dept. of Math and Stat. Two Asst. Prof. pos. (One specialty; Math, the other; Stat) tenure track. Req. Ph.d (or within 1 yr. of competion), demonstrated commitment to quality teaching, strong research potential. All fields will be considered, but pref. given to applied math, and theoretical and applied stat. Send vitae, 3 letters of recommendation to: Aigli Papantonopoulou, Chair, Search Committee, Dept. of Math and Stat, Trenton State College, Hillwood Lakes, CN 4700, Trenton, NJ 08650- 4700. Deadline: Mar. 1, 1991 or until pos. are filled. Non-U.S. citizens must incl. statement of current visa status.

TRINITY COLLEGE. Dept. of Math. invites applications for a tenure track position, at the rank of assistant professor, beginning in the academic year '91-'92. The normal teaching load is five semster-courses/yr. While we will be happy to receive applications from those with any specialty, we will be particularly interested in algebraists, logicians, and persons whose research interests might intersect with current department members' areas: complex analysis, functional analysis, geometry, graph theory, combinatorics, and mathematical statistics. Requirements for the position: Ph.D in mathematics, evidence of teaching excellence at the undergraduate level, indications of promise in research, and interest in curriculum development. Applications should send a c.v., three letters of reference (at least one of which addresses teaching) and a statement of teaching and research interests to: Search Committee Chair, Dept. of Mathematics, Trinity College, Hartford, CT 06106. No decision will be made prior to January 21, after which the position may be filled at any time. Representatives of the department will attend the employment register at the joint Annual Mathematics Meetings in San Francisco in January, 1991.

UNION COLLEGE. Math. Dept. Tenure track Assistant Professorship (also a possible nonrenewable, 3-yr. position) starting September, 1991. 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 four Vaxs, student Mac and PC rooms, and graphic labs; every math faculty office has a Mac SE/30, II, or IIci, each equipped with Mathematica. The teaching load is 5 courses/yr. 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 W. Zwicker, Search Committee Chair, Union College, Schenectady, NY 12308.

UNIVERSITY OF ALABAMA AT BIRMINGHAM. Dept. of Math. Apps. are invited for 1 or more anticipated tenure or tenure track pos. Pref. will be given to strong cands. whose research interests are compatible with those of our current faculty; this includes numerical PDE/Scientific computation, mathematical physics, partial differential equations, nonlinear analysis, dynamical systems, incl. topological dynamics, differential topology and differential geometry. Faculty members have access to the Alabama Super Computer (using a Sun Station and a T-1 line to a Cray X-MP/24). Rank and salary will be subject to qualifications. Send as soon as possible a c.v., selected reprints, and 3 letters of reference to: Search Committee, Dept. of Math., University of Alabama at Birmingham, Birmingham, AL 35294.

UNIVERSITY OF ALABAMA. The department expects to fill two, or possibly more, tenure track positions at the rank of Assistant Professor or higher beginning August 16, 1991. Areas for specific consideration include mathematical statistics and topology. Outstanding candidates in other areas may also be

considered. Applications for Assistant Professor should have or expect to have a Ph.D or the equivalent by August 16, 1991. Excellence in both teaching and research is required. Applications for visiting positions may also be considered. Send a c.v., reprints and/or preprints, and at least three letters of recommendations to: Search Committee, Department of Mathematics, University of Alabama, Box 870350, Tuscaloosa, AL 35487-0350.

UNIVERSITY OF ARIZONA. Department of Mathematics. Tuscon, AZ 85721. announces several positions which will be available beginning in Fall 1991. Tenure Track Positions: Excellent research record or potential. A strong committment to teaching required. Fields should complement but not duplicate existing department research strengths in algebra, arithmetic geometry, computational science, differential geometry, mathematical physics, nonlinear analysis, nonlinear science, number theory, and probability. Postdoctoral Fellowships: Applicants with stengths in all areas compatible with department interests, but specificall geometry and mathematical physics are encouraged to respond. In addition, special Center of Excellence Awards in nonlinear optics and fluid mechanics are available. The Mathematics will also have several visiting positions for next year. We encourage early application. Deadline date will be February 1, 1991 or whenever position is filled. Send applications to Alan C. Newell, Head, Department of Mathematics, University of Arizona, Tuscon, AZ 85721.

UNIVERSITY OF AUCKLAND, New Zealand. Dept. of Math. and Statistics lectureship opening. The Dept. of Math. and statistics teaches a full range of undergrad. and postgrad. courses. Within the dept., there are 2 units which operate with a certain degree of autonomy. These are the Statistics Unit and the Applied and Computational Math. Unit. The Dept. has particular research strength in combinatorics and graph theory, finite group theory, functional analysis, complex analysis, topology, numerical analysis and statistics. Apps. should have a proven record in teaching and research in some branch of Pure Math. Apps. from cands. with expertise in Combinatorial Math. or other areas of Pure Math. related to Computer Science are particularly welcome. Commencing salary will be established within the range $NZ37,440 - $49,088 per annum. Conditions of Appt. and Method of Application are available from the Asst. Registrar, Academic Appointments, University of Auckland, Private Bag, Auckland. Deadline: Feb. 28, 1991.

UNIVERSITY OF CALIFORNIA, BERKELEY. Fellowships in Math and Molecular Biology. The program in math and molecular bio. has grad and post doc. fellowship support available. Current topics in program incl. geometry, topology, and sequence analysis of DNA, molecular dynamics, and mapping functions and algorithms for DNA and protein structure prediction. Other areas will be considered. Fellowhships can be held at any university or college in the U.S. Deadline for initial contact: Jan. 15, 1991. Apply to: Dr. S.J. Spengler/Dr. N.R. Cozzarelli, 214A Stanley Hall, Univ. of CA, Berkeley, CA 94720. E-Mail: SYLVIA@VIOLET.BERKELEY.EDU.

UNIVERSITY OF CALIFORNIA, SANTA CRUZ. Dept. of Math expects to have 2 JWT Youngs Asst. Professorships in Math available beg. with the 1991/92 academic year. Also expect to have several other visiting pos. Invite all apps. from qualified mathematicians in all fields. Appointees will be expected to teach, pursue their research, and perform some dept. or univ. service. The JWT Youngs Fellow pos. are available for a 2-year period with the possibility of an extension for a 3rd yr. The other visiting pos. are avail.for periods ranging from 1/4 to the full academic year, with a poss. ext. to a 2nd yr. JWT Youngs Fellowship will be Asst. Prof. level only, while other visiting pos. may be at either asst., assoc. or full prof. level, as appropriate. Qualifications: Ph.D. in math and a demonstrated excellence in research and teaching or potential for excellence. Salary range: $33,900 to $58,300 commensurate with qual. and exp. Avail. Fall 1991. App. deadline: Jan 15, 1991. Please refer to pos. #T90-19. Send vitae, 3 letters of ref. and information about teaching and research exp. to: Harold Widom, Chair, Recruitment Committee, Math. Dept. University of CA, Santa Cruz, CA 95064.

UNIVERSITY OF CALIFORNIA - LOS ANGELES. Subject to admin approval, 2 regular positions in pure and applied mathematics. The 6 specific search areas are as follows: 1. logic and mathematical computer science; 2. algebra (inc. algebraic geometry and representation theory), number theory and combinatorics; 3. geometry and topology (including dynamical systems and geometric partial diff. equations); 4. analysis and differential equations (including Lie groups and math physics); 5. statistics, probability and game theory; 6. applied and computational mathematics. Very strong promise in research and teaching required. Positions initially budgeted at the asst. prof. level. Sufficiently outstanding candidates at higher levels will also be considered. Teaching load: averaging 1.5 courses per quarter, 4.5 quarter courses per year. To apply, write to Alfred W. Hales, Chair, Dept. of Mathematics, UCLA, Los Angeles, CA 90024-1555. Attn: Staff Search.

UNIVERSITY OF CALIFORNIA - LOS ANGELES. Temporary Positions. 1. 2 E. R. Hedrick Asst. Professorships. Apps must show very strong promise in research and teaching. Salary: $38,500. 3 year

appt. Teaching load: 4 quarter courses per year, which may include 1 advanced course in the candidate's field. Pref. given to apps completed by 1/1/91. 2. Subject to admin approval, several Research Asst. Professorships in Computational and Applied Mathematics. Apps must show very strong promise in research and teaching. Salary; $38,500. 1 year appt. probably renewable up to 2 times. Teaching load: at most 4 quarter courses per year, which may include one advanced course in the candidate's field. Pref. given to apps completed by 1/1/91. 3. Subject to admin approval, 1 or 2 Asst. Professorship in the Program in Computing (PIC). Apps must show very strong promise in teaching and research, preferably in the general area of Logic and Computation. Teaching load: 4 quarter programming courses and an advanced quarter course of the candidate's choice per year. 2-year appt, possibly renewable once. Salary range: $38,500-$44,000. Pref. given to apps completed by 2/1/91. 4. Subject to admin approval, 1 or 2 Lectureships in the Program in Computing (PIC). Apps must show very strong promise in teaching of programming. M.S. in Computer Science or equivalent degree preferred. Teaching load: 5 quarter programming courses per year. 1-year appt, possibly renewable up to 5 times, depending on the needs of the Program. Salary is based on experience and begins at $32,676. Pref. given to apps completed by 2/1/91. 5. Subject to admin approval, a few Adjunct Asst. Professorships. 1 year appts, probably renewable once. Strong research and teaching background required. Salary $33,900-$38,200. Teaching load: 5 quarter courses per year. 6. Subject to admin approval, several positions for visitors and lecturers. To apply, write to Alfred W. Hales, Chair, Dept. of Mathematics, UCLA, Los Angeles, CA 90024-1555. Attn: Staff Search.

UNIVERSITY OF CINCINNATI. Department of Mathemtical Sciences, Cincinnati, OH 45221-0025. Two tenure track Assistant Professorships plus the Otto Szasz Assistant Professorship (a one or two year terminal appointment for a new or recent Ph.D. recipient) in areas to be determined among existing research groups in the department are available for Septemtber, 1991. The Harris Hancock Assistant Professorship (a one or two year terminal appointment for a new or recent Ph.D recipient) in selected areas of nonlinear analysis (Dynamical Systems, Partial Differential Equations, Numerical Analysis) is also available. Other visiting positions may become available. All positions require a Ph.D and strong potential for quality reserach and teaching. Send c.v. and direct three letters of recommendation to David Minda, Head.

UNIVERSITY OF IDAHO, Dept. of Math & Stat, Moscow, ID 83843 (208-885-6742) Assistant Professor of Mathematics. Tenure track teaching and research position. Ph.D. in mathematics required with a field of specialty in the area of probability, either theory or applied. The department has twenty faculty and twenty teaching assistants and gives graduate degrees through the Ph.D. Send rèsume, transcripts, and 3 letters of recommendation. Processing of applications will begin on February 15, 1991. Applications received after February 15 may be considered.

UNIVERSITY OF IOWA. Dept. of Math is expanding its search for tenure track appts. at the Asst. or beginning Assoc. Prof. level to include a specialist in the topology of manifolds. This appt. is to be effective beginning the 1991- 92 academic year. Please refer to our previous ad in the Nov/Dec 1990 issue of this journal for further details. To apply send a complete vitae and 3 letters of recommendation to: Prof. W.A. Kirk, Chair, Dept. of Math, University of Iowa, Iowa City, IA 52242.

UNIVERSITY OF IOWA Division of Curriculum and Instruction is seeking applicants for the position of Asst. Prof. of Math. Education. Resp. include teaching 2 courses/semester in the elementary or secondary math teacher preparation programs and/or the MA and Ph.D. math education program. Directing and conducting significant research on math education is also an exception. Candidates should hold a Ph.D. in that education or equivalent program, have successful teaching experience at either the elementary or secondary school level, show strong preparation in math, be experienced in the use of technology in math instruction, demonstrate a commitment to research and publication in the areas of learning and teaching math, and have a commitment to excellence in teaching. Apps. will be reviewed Jan. 30, 1991 and continue until the pos. is filled. Send letter of application, vitae, transcripts and 3 letters of recommendations to: Mathematics Education Search Committee, c/o Dr. Marilyn Zweng, Division of Curriculum and Instruction, Lindquist Center, the university of Iowa, Iowa City, IA 52242.

UNIVERSITY OF KANSAS, Dept. of Math. Apps. are invited for a visiting Asst. Prof. pos. commencing Aug. 16, 1991 or as negotiated. (The availability of this position is contingent upon final administrative approval.) Pref. will be given to cands. whose research interests mesh well with those of present math dept. faculty. Require Ph.D. or Ph.D. dissertation accepted with only formalities to be completed. Application, detailed resume with description of research, and 3 recommendation letters should be send to: C.J. Himmelberg, Chairman, Dept. of Math., 405 Snow, University of Kansas. Lawrence, KS 66045-2142. Deadline: Feb. 1, 1991 for first consideration, then monthly until Aug. 1, 1991.

UNIVERSITY OF MINNESOTA, MINNEAPOLIS is looking for a research Assoc. to work with faculty on the development and analysis of numerical algorithms for liquid crystals and crystals with symmetry-related variants. This is a 12-month position with the possibility for an extension of another 12 months. Annual salary approx. $30,000. Starting date 3/15/91 or later. Req. qualification: Ph.D. in math. or foreign equiv. Desired experience: expertise in the analysis and development in algorithms for PDE used in mechanics. Experience in developing codes and large-scale computing. Send application, resume to: University of Minnesota, School of Math., 127 Vincent Hall, 206 Church Street, S.E., Minneapolis, MN 55455. Attn: Monika Stumpf, Exec. Secretary.

UNIVERSITY OF MISSOURI-COLUMBIA. Dept. of Mathematics, Columbia, MO 65211. Apps invited for 2 tenure track positions at the rank of asst. prof beg 8/91. Positions require PhD, quality teaching, and a commitment to a distinguished research career. Selections for each position will be based primarily on demonstrated research achievement in an area complementary to areas of ongoing departmental research. Send c.v. and letter of app, and arrange for 3 letters of rec to be sent to: Prof. L. J. Lange, Chair at the above address. App deadline is 1/22/91, or until positions are filled thereafter. Apps received after 3/1/91 cannot guarantee consideration.

UNIVERSITY OF NEBRASKA-LINCOLN. Dept. of Math and Statistics. Apps. are invited for a tenure track pos. at the Asst. Prof. level beginning Fall 1991. Cands. must have a Ph.D. in math or expect to receive their degree by Aug. 1991. Cands.. must have excellent teaching ability and outstanding research potential in an area which is will complement the existing expertise in the dept. Apps. accepted from qualified cands. in all areas of math, but cands. in numerical analysis, differential geometry, operations research, operator theory and combinatorics are particularly urged to apply. Send vitae and 3 letters of recommendation to: Search Committee Chair, Dept. of Math, University of Nebraska-Lincoln, Lincoln, NE 68588-0323. Review of apps. will begin Feb. 1, 1991 and continue until pos. is filled.

UNIVERSITY OF NORTH CAROLINA, Dept. of Math. Apps. are invited for tenure track appts. effective Fall 1991. Rank and salary depend on qualifications and budget considerations. Ph.D., exceptionally strong research program and commitment to excellent teaching required. Send c.v., abstract of current research program and 4 letters of recommendation to: Search Committee Chairman, Math. Dept. CB #3250 Phillips Hall, UNC at Chapel Hill, Chapel Hill, NC 27599-3250. Apps. deadline Feb. 1, 1991.

UNIVERSITY OF NORTHERN IOWA. Asst. Prof. of Math. New tenure track pos. to aid in teaching our general ed. courses and to support our majors and grad students. Applicants should have a doctorate in a core area of math and be committed to quality teaching and scholarship at a comprehensive univ. Appt. is for Aug. 1991. Salary is highly competitive, fringe benefits are excellent. Application screening begins Feb. 15, 1991. For more info. contact: Philip East, Math and CS, University of Northern Iowa, Cedar Falls, IA 50614. (319-273-2631. EAST@ISCSVAXUNI.EDU.

UNIVERSITY OF OKLAHOMA, Dept. of Math. Apps. are invited for 2 anticipated tenured or tenure track pos. in Math. beginning Fall 1991. One pos. at the Assoc. Prof. level, with pref. given to applicants with research interests in areas of Geometry, Topology, or Analysis. One Asst. Prof. pos. at the entry level with pref. given to research interests compatible with those of our current faculty. Cands. must have Ph.D., demonstrated excellence in research, and a strong commitment to high quality teaching. Duties incl. research, normally teaching 6 credit hrs. per semester, and Departmental and University service appropriate to rank. Salary will be commensurate with qualifications and experience. There may also be visiting positions. Apps. should send their vitae, and 3 letters of reference to: Dr. Ruediger Landes, Search Committee Chair, Dept. of Math, University of OK, 601 Elm Ave., Room 423, Norman, OK 73019-0315. Initial screening begins Dec. 15, 1990 and continues every 2 weeks after.

UNIVERSITY OF SAN DIEGO, Math Dept. One tenure track pos. and 2 sabbatical replacement pos. are anticipated beginning Sept. 1, 1991. These are full-time appts. with a 12-unit teaching load per semester. Apps. must demonstrate a strong commitment to teaching undergrads in a liberal arts setting. Apps. for the tenure track appt. must have a Ph.D. in math or math education. Some interest in educating prospective teachers is desirable. Send vitae, 3 letters of reference to: Dr. Stan Gurak, Chair, Math & Comp. Sci. Applications will be accepted until Feb. 15, 1991 or until pos. filled.

UNIVERSITY OF TENNESSEE AT CHATTANOOGA, invites applications for Head of the Dept. of Math. A Ph.D. in a math science and at least 5 years of college math teaching experience are required. Apps. should provide evidence of leadership in curriculum development, teaching, public service and research/scholarly activities. In this primarily undergrad institution, the faculty is expected to excell in teaching while maintaining a strong commitment to research and public service. Send applications with current vitae to: Dr. Paul Gaston, Dean, College of Arts and Sciences, 119 Holt Hall, UTC, Chattanooga, TN 37403-2598. Apps. received by Jan. 31, 1990 will be assured full consideration.

UNIVERSITY OF TENNESSEE. The Mathematics Dept. of the University of Tennessee, in an effort to significantly improve its research position, seeks to fill a tenure track asst. professorship or junior assoc. professorship. Employment begins 8/91. The Dept.'s interests are in the areas of algebra, analysis, probability, and topology. Substantial research accomplishments and promise, as well as dedication to teaching are paramount. Interested apps should arrange to have a vita, 3 ref letters, and a research statement to: Professor John B. Conway, Mathematics, U of Tennessee, Knoxville, TN 37996-1300. Review of apps begins 12/90 and will continue until position filled.

UNIVERSITY OF TENNESSEE. A tenure track joint appt in the Dept. of Math. and the Grad. Program in Ecology is available starting fall 91. Appointee is expected to interact with a large group of mathematical and theoretical ecologists at UTK and Oak Ridge National Lab. (Environmental Sciences Div.), have or establish an active research program, teach a variety of undergrad and grad courses in math, and lead grad seminar courses in the Ecology Program. A PhD in Math., ecology, or related area is required as well as previous teaching experience. Areas of expertise in mathematical ecology is open. Submit c.v., transcripts, brief plan of future research, and have 3 letters of rec sent to: Dr. Thomas G. Hallam, Chair, Math Ecology Search Committee, Dept. of Mathematics, U of Tennessee, Knoxville, TN 37996-1300. Review of apps begins 12/31/90 and continues until position filled.

UNIVERSITY OF TEXAS AT ARLINGTON. Dept. of Math expects to fill several pos. beginning Fall 1991. Salary and rank are commensurate with qualifications. The selected cands. must have excellent credentials in research and teaching. The desired areas of expertise are Differential or Algebraic Geometry, Computational Geometry, Partial Differential Equations, Functional Analysis, Statistics and Applied Math. Send resume, 3 letters of recommendation to: Dr. Danny Dyer, University of Texas at Arlington, Dept. of Math, Box 19408, Arlington, TX 76019. Attn: Recruiting Chairman.

UNIVERSITY OF TEXAS AT AUSTIN. Openings are expected for Fall 91 at all levels, including Instructor (customarily appointees are new PhDs), Asst. Prof. (customarily appointees have at least 2 years experience beyond PhD), Assoc. Prof, and Prof. Candidates should have an outstanding research ability and concern for teaching. Salaries are competitive. If you have access to e-mail, request a form from recruit@math.utexas.edu. Otherwise, please send vita, detailed summary of research interests, and three rec letters to Dept. of Mathematics, U of Texas at Austin, Austin, TX 78712. Instructor and Asst. Prof.: c/o Recruiting Committee. Assoc. Prof. and Prof.: c/o John Dollard, Chair.

UNIVERSITY OF WASHINGTON, Dept. of Math. 4 Fellowships, approx. $12,000 each, partly funded by the Dept. of Education. 1 Teaching Fellowship, $12,500/yr. 6 11-mon. TA positions, $10,470/yr. 8 9-month TA pos., #8,298/yr. For additional information, please write to: Ms. Sheila Farr, Graduate Admissions, Dept. of Math, University of Washington GN-50, Seattle, WA 98195.

UNIVERSITY OF WISCONSIN CENTER-WASHINGTON COUNTY. Dept. of Math. Three tenure track positions as Instructor or Asst. Prof. Start Aug 19, 1991. MA in math, teaching experience, and advanced course work required. Doctorate encouraged. Send letter of app., vitae, all transcripts, 3 letters of recommendations to: Gary Britton, Chair, 400 University Dr., West Bend, WI 53095. (414) 335-5200.

VANDERBILT UNIVERSITY, Dept. of Math. Asst. Prof. specializing in topology. Initial 3-year appt. beginning Fall 1991 (renewable; tenure track). Outstanding research potential and evidence of effective teaching required. Have vitae and 4 letters of reference (incl. 1 about teaching) sent to: Prof. Glenn Webb, Chairman, Vanderbilt University, Dept. of Math, 1326 Stevenson Center, Nashville, TN 37240.

VANDERBILT UNIVERSITY, Dept. of Math. Asst. Prof. specializing in approximation theory, computer-aided design, or numerical analysis. This pos. is intended for a person whose primary research involved computing. It is an initial 3-year appt. beginning Fall 1991. It is renewable and tenure track. Outstanding research potential and evidence of effective teaching is required. Have vitae, 4 letters of reference (incl. 1 about teaching) sent to: Prof. Glenn Webb, Chairman, Vanderbilt University, Dept. of Math, 1326 Stevenson Center, Nashville, TN 37240.

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY. Dept. of Math. Apps. are invited for a tenure track appt., subject to budgetary approval, at Asst. Prof. level beginning 1991-92 academic year. A Ph.D. and strong research potential are required. Pref. will be given to cands. with postdoc exp. Primary ares of interest are algebraic and differential geometry, discrete math, dynamical systems, and computationally oriented math. Apps. will be accepted until March 15, 1991 or until pos. is filled. Apps. should be send with vitae, 3 letters of reference to: Chair, Search Committee, Dept. of Math., Virginia Tech, Blackburg, VA 24061-0123.

WAYNE STATE UNIVERSITY, Dept. of Math. Apps. are invited for an anticipated tenure track pos. in statistics or applied math. Also possible visiting positions. Ph.D. in math req. Excellence in research and teaching expected. Apps. should incl. a signed, detailed vitae, description of current research interests, 3 letters of recommendation to: Wayne State University, Dept. of Math, Detroit, MI 48202. Attn: Pao-Liu Chow, Chair.

WAYNE STATE UNIVERSITY, Computer Science Dept. Invites apps. and nominations for pos. of Computer Sci. Dept. Chair. Cands. must exhibit a distinguished research record, as well as a commitment to teaching and strong admin. skills. A Ph.D in C.S. or a related field is expected. Dept. has 16 faculty members. Current research activities are in database sys., software eng., artificial intelligence, computer vision and image processing, distributed sys., neural networks, biocomputing, numerical methods, and natural lang. processing. Dept. has appx. 150 grad adn 350 undergrad students and offers the Ph.D., MS, MA, BS, and BA degrees. Dept. equipment incl. a network of Sun SPARCstations, MicroVAX 3600 and Mac P.C. all connected to NSFNet. Also have dedicated machines for computer vision, symbolic processing, parallel computing, and biological modeling. Dept. also owns an AT&T 3b2-1000 which provides Usenet news service to several of the University's dept. Letters of appl., 3 reference names should be sent to: Dr. L.D. Favro, c/o Maureen Schore, Wayne State Univ., Dept. of CS, 431 State Hall, Detroit, MI 48202. Review of apps. begins Feb. 15, 1991 until pos. filled.

WESTERN WASHINGTON UNIVERSITY. Dept. of Math. Tenure track and visiting pos. to begin Fall 1991. Ph.D. in math req. Cands. especially sought in discrete math (particularly graph theory), modeling optimization, statistics, math education, elementary / secondary teaching experience pref. Resp. incl. teaching math and methods courses, developing inservice opportunities and research projects, and improving our MA program. Rank and salary open, but substantial research record req. for appts. above Asst. Prof. level. Pos. subject to continuing availability of funds. Apps. should send vitae, transcripts, 3 letters of recommendation addressed to teaching and research to: Dr. Thomas T. Read, Chairman, Dept. of Math, Western Washington Univ., Bellingham, WA 98225-9063. App. deadline: FEb. 1, 1991 or until pos. is filled.

YORK UNIVERISTY, Faculty of Arts, Dept. of Math and Statistics. Apps. are invited for 1 tenure track pos.in statistics, rank open, and 1 limited term (3 years) pos. in one of the following areas of math: algebra, geometry, history of math, or math education to commence July 1, 1991, subject to final approval by the University. Apps. must have a completed Ph.D. and proven research and teaching abilities at both the undergrad and grad levels. Send resumes, 3 letters of recommendation by Jan. 11, 1991 to: Walter Tholen, Chair, Dept. of Math and Statistics, York Univ., 4700 Keele St., North York, Ont. M3J 1P3, Canada. FAX (416) 736- 5735; E-Mail: MATHSTAT@VM1.YORKU.CA.

Administrative Positions

OAKLAND UNIVERSITY. Dept. of Math. Apps. and nominations are invited for pos. of Chairperson of the Dept. of Math. Sciences. Minimum qualifications incl. a Ph.D. in math. science, significant post-doc. academic exp. in the math. sciences or comparable activity, a substantial research record, and an active commitment to research, demonstrated exp. in various academic or professional leadership positions, and an academic record to justify appt. at the rank of Prof. in the Dept. of Math. Sciences with tenure. App. should send a letter, vitae, and the names and addresses, and telephone numbers of 3 references. Send nominations and applications to: Chairman Search Committee, Dept. of Math. Sciences, Oakland Univ., Rochester, MI 48309- 4401. Review of apps. will begin December 12, 1990.

UNIVERSITY OF ARIZONA. Nominations and applications for the position of Chairman of the Interdisciplinary Program in Applied Math., effective July 1, 1991. Chairman will be resp. for administering the Program, which offers degrees at the MA and Ph.D. level, and for fostering Interdiciplinary research involving applications of math. The Chairman reports directly to the Vice President for Research. He/she will also hold a faculty appt. in the Dept. of Math. and/or other relevant Depts. Qualifications incl: Strong intellectual leadership, academic exp. related to math. and its applications, experience in, and commitment to, grad. student education, mgmt. and organization skills. Deadline for apps. is Feb. 1, 1991 until pos. is filled. Send to: Prof. Alan C. Newell, Dept. of Math., University of Arizona, Tucson, AZ 85721.

UNIVERSITY OF DELAWARE Department of Mathematical Sciences Chairperson The University of Delaware invites applications for the position of Chair of the Department of Mathematical Sciences in the College of Arts and Science. Applicants for the position should have an outstanding record of research and scholarly activity and should have the skills to chair a department with major research, teaching, and service responsibilities. The Department has 40 regular faculty positions and an active graduate (PhD)

program. Programs include pure mathematics, applied mathematics, and statistics. The Department is unusual in its strength and commitment to applied mathematics and related areas of analysis. The University has good computing and library facilities,and in addition, the Department has a number of workstations and two Sun 3/180 file servers. The University of Delaware is located in the pleasant university town of Newark midway between Washington, DC and New York City. Applicants should submit a resume, the names and addresses of three references, and a letter of interest to (or contact) Prof. B. F. Caviness , Chair: SearchCommittee for Mathematics Department of Computer and Information Sciences 103 Smith Hall University of Delaware Newark, DE 19716 Phone: 302/451-8234 email: caviness@udel.edu The position will be available beginning September 1, 1991. The deadline for the receipt of applications is March 1, 1991.

UNIVERSITY OF IDAHO. Dept. of Math & Stat, Moscow, ID 83843 (208) 885-6742. Director of Math. and Statistics Assistance Center. Requires MS (pref. in math.). Organize and direct operation of asst. center for undergrads taking math and stat courses. Duties include hiring and training students assts. Desire exp. in teaching, ability to evaluate math skills, and experience with computer aided instruction. Tenure track, rank of instructor. Send resume, transcripts, and 3 letters of recommendation no later that 3/15/91, or until suitable applicant is found.

Of Interest

European Women in Mathematics. The next general meeting of EWM will be held at CIRM, Luminy, France from December 9-13, 1991. The programme will include expository mathematical talks on selected themes and discussion on issues of interest to women mathematicians. For further details, contact Eva Bayer,Universite de France Comte, Faculte des Sciences, URA 741,CNRS-Mathemetiques, 16, Route de Gray, 25030 Besancon, France bayer@cguege11.bitnet or Caroline Series, Mathematics Institute, Warwick University, Coventry CV4 7AL, England. cms@maths.warwick.ac.uk Tel(011-44-)(0)- 203-523739

ADVERTISEMENT GUIDELINES

AWM will accept advertisements for the AWM Newsletter for positions available, programs in any of the mathematical sciences, professional activities and opportunities of interest to the AWM membership and other appropriate subjects. The Executive Director, in consultation with the President and the Newsletter Editor when necessary, will determine whether a proposed ad is acceptable under these guidelines.

All institutions and programs advertising in the Newsletter must be Affirmative Action/Equal Opportunity designated.

Institutional members of AWM receive two free ads per year. All other ads are $20 each for the first eight lines of type. Ads longer than eight lines will be an additional $15 for each eight lines or fraction thereof (i.e., $35 for 9-16 lines, $50 for 17-24 lines, etc.)

Association for Women in Mathematics

Individual Membership Form 90-91

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

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

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Present position: _____

Firm or institution: _____

_____

City State Zip/Country

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

_____ _____ _____ _____ _____

The **AWM Directory of Women in Mathematical Sciences** will be updated and published bi-annually beginning in 1991. Please indicate below if you would like your name, address and areas of interest included in the 1991 Anniversary Edition.

Check one: _____yes _____no

Signature: _____

Membership Categories

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

For **individual members joining for the first time,** the dues are $15 for the first two years. **Renewing individual members** pay $20 dues. **Family membership:** $25. **Contributing members:** $45. **Students, retired individuals, and unemployed individuals:** $5. Contributions of any size very welcome.

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Please indicate amount enclosed.

Individual member	____ $15 (first 2 years)	____$20
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Contributing member		____$45
Student, retired or unemployed		____$5
Foreign members, other than Canada or Mexico		+$8 for postage

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Please consult the list of major headings of the 1980 Math Subject Classification and the categories specific to AWM.

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

001 Education: K-8
002 Education: 9-12
003 Education: Undergraduate
004 Education: Graduate
005 Gender issues
006 Affirmative action
007 History of women in math sciences
008 Other (please specify):
_____
_____

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

Association for Women in Mathematics

Institutional Membership
Date.....19.....

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

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_____ **Sponsoring, Category II** (may nominate 5 students for membership): **$75**

_____ **Regular: $50**

*Please list student nominees on separate sheet of paper

AWM

Newsletter *Volume 21, Number 1, January-February, 1991*

AWM
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FOR WOMEN IN
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