

Association for Women in Mathematics

Volume 11, Number 2

NEWSLETTER

March-April 1981

PRESIDENT'S REPORT

San Francisco Meeting. Olga Taussky-Todd's Emmy Noether Lecture entitled "The many aspects of Pythagorean triangles" was a great success and drew a big crowd. She is planning to publish the article. There was also an AWM panel on "AWM at ten: past, present and future". Mary Gray, Alice Schafer, and Lenore Blum traced the development of AWM from the time it was founded ten years ago; and Michele Vergne reflected on the future. Their talks will appear in the Newsletter. Linda Keen was the moderator.

A press conference was organized by the AMS to discuss the articles in Science (December 12) on the Stanley-Benbow study. We issued a statement which said "The Association for Women in Mathematics is outraged by the irresponsible coverage in the December 12 issue of Science of a study of dubious validity on sex differences in mathematical ability. We strongly support the views of the Joint Committee on Women in Mathematics as expressed in an editorial to appear in the January 16 issue of Science." This has been communicated to the Editors of the Notices of the AMS. Mary Gray and Alice Schafer were at the press conference representing the AMS-MAA-SIAM Joint Committee on Women. Their editorial (referred to in our statement) has now appeared in Science.

The first Gibbs Lecture by a woman was given by Cathleen Morawetz and was by all accounts very successful.

Careers booklet. This booklet, called "The Sky's the Limit" and produced by the Bay Area Math/Science Network, is now available and costs \$3. Judy Roitman has already described it in the Nov.-Dec. 1980 Newsletter. Copies can be obtained from the Math/Science Network, Mills College, Oakland, CA 94613.

International Congress of Mathematicians, Warsaw. Mary Gray will organize an AWM event at this meeting. If you have any suggestions, please write to her.

Emmy Noether Symposium. Among other things, the AWM Executive Committee discussed the format of the symposium we are planning at Bryn Mawr in 1982. The organizing committee will draw up a plan based on these discussions. The committee consists of Michael Artin, I.N. Herstein, Rhonda Hughes (chair), Alice Schafer, Martha Smith and Bhama Srinivasan.

Science Authorization Bill. Under the provisions of this Bill the NSF has money available for research initiation grants by women. Women who have never held grants and either have had their Ph.D.'s for less than five years or have had their careers interrupted are eligible to apply. For details write to Judith Sunley of the Mathematical Sciences Section, NSF. (Phone: (202) 357-9564)

Meetings Committee. A Meetings Committee, consisting of Bettye Anne Case (chair), Pat Kenschaft, Susan Montgomery and Rebekka Struik has been formed to organize AWM meetings in conjunction with the Summer and Winter meetings of the AMS.

Inaugural Address. In view of recent events in Washington, I hope you will pardon me for calling this my Inaugural Address. I will begin by thanking Judy Roitman for the tremendous effort she has put in for AWM both as president and in previous years; I sincerely hope she will not ride off into the sunset, but will continue to help us in many ways. In fact, what I am about to say is essentially a continuation of her last report.

While I listened to our panel speakers in San Francisco, I began to realize that something close to a revolution has taken place in ten years. It is now commonplace to see large numbers of women at meetings, and we have had women speakers and committee members at many levels. But we still have a lot of catching up to do; I still see too many women not aspiring to the goals they are capable of attaining, and working in institutions which underutilize their research capabilities and overutilize their administrative capabilities. We have to set high standards of achievement for ourselves and maintain them; for those of us who are older, there is no such place as "over the hill".

Our goal, then, is to do all we can to help women take their rightful place in the mathematical world. This means, for instance, as has been said by others before me, increasing the visibility of women all around us and encouraging young women to push themselves to their limits. If you would like to work on some specific project and would like me to set up an AWM Committee to help you, please let me know. If you are already involved in something that AWM doesn't know about and should, please write to me. But please act now.

Bhama Srinivasan
Math Dept.
University of Illinois at
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Chicago, IL 60680

AWM MEETING

An AWM informal luncheon meeting/discussion will be held at noon on Saturday, May 2, 1981 at Illinois State University, Normal, Illinois. This will be directly after the 1981 joint meeting of the Illinois Sections of the Mathematical Association of America and the American Association for Physics Teachers, May 1-2, 1981. For more information contact: Joan Wyzkowski, Department of Mathematics, Bradley University, Peoria, IL 61606. Phone: (309) 676-7611, ext. 400.

MATH ANXIETY FILM

Math Anxiety: We Beat it, So Can You!, produced by Jason Films, sheds light on the origins and pervasive effects of math anxiety. The film follows the progress made by a class of math anxious adults and clearly demonstrates that supportive, non-threatening teaching methods can prevent or overcome this condition. The filmmaker has interwoven scenes from the classroom with retrospective comments by the students and the teacher after the class has been completed. 29 minutes, color. Rental: \$35 for 3 days. Write Ms. M. Westlund, EDC Distribution Center, 55 Chapel St., Newton, MA 02160.

REPORT OF THE TREASURER: December 16, 1980

Accounting for the period June 1, 1980 - November 30, 1980

Balance, June 1, 1980 \$5838.30

Receipts

Dues - individuals	\$8494.30
- families	740.00
- institutions	1773.70
Advertising fees	350.00
Contributions (1)	589.97
Interest	178.46
Miscellaneous (2)	<u>564.75</u>

Total \$12,691.18

Expenses

Wages and FICA	\$1,840.99
Newsletters (3)	2,022.84
Dues and fees (4)	150.00
AWM meetings (5)	362.75
Operating expenses (6)	488.19
Miscellaneous (7)	<u>456.34</u>

Total \$5,321.11

Balance, November 30, 1980 \$13,208.37

- (1) This includes \$180 in credit from Wellesley College towards data processing charges.
- (2) This covers \$475.99 received as reimbursement for credit towards secretarial services to organizations other than AWM.
- (3) Typing, postage, and printing for 3 issues.
- (4) CBMS, Massachusetts Incorporation fee.
- (5) Refreshments for the San Antonio meeting and honorarium for the San Francisco meeting.
- (6) Postage, phone, supplies, and duplicating.
- (7) This covers \$448.99 in credit towards supplies and secretarial services to organizations other than AWM.

Membership Statistics

Our mailing list totals 817,*including 77 institutions in the U.S. plus 38 members in Canada and abroad.

*This number is lower than 948 recorded in Aug., 1980 because we have just dropped 131 people for nonpayment of dues.

Respectfully submitted,
Donna L. Beers, Treasurer

MATHEMATICS, THE MILITARY, AND THE MULLAHS

by Mary Gray, American University

If males had genetically superior mathematical ability, one would expect to find boys performing better than girls in any culture. However, I have recently come across an interesting counterexample. In talking with the faculty at the Palestinian Birzeit University in the Israeli-occupied West Bank, I learned that several of them are very concerned with mathematics education in the elementary and secondary schools of the Occupied Territory.

In 1966, under UNESCO auspices, a new mathematics curriculum was developed for the Arab countries. Before this could be implemented, the Israelis occupied the West Bank region. Nothing was done to improve or modernize the mathematics curriculum until in 1972 Birzeit University began an in-service program to introduce the new curriculum. This was closed down by the military government after a year and a half, and the military started their own program. Munir Fahseh, currently a Birzeit faculty member, headed the program. In addition to curricular reform, he instituted mathematics clubs and a magazine, teacher training, and related activities. He told of some of his innovations in a communication this past summer at the International Congress on Mathematics Education at Berkeley, and a paper will soon be published discussing the project and its implications in detail.

I found fascinating his accounts of the interest which was stirred up generally; he reported overhearing villagers on a bus discussing the possibility of a triangle whose angles summed to other than 180° . He has some extremely interesting insights on how to present mathematics and its cultural context.

Eventually the program was denounced both by the conservative religious leaders and by the military authorities. The difficulty the mullahs found was in his teaching that in mathematics there is something less than absolute truth--that different axiom systems are possible. Today mathematics, tomorrow religion! While the military were not specific as to their complaints, the sense of community among teachers and students from various schools, the uniting for a common purpose, is a spirit they consistently seek to discourage, as well as their general distaste for challenges to authority in any form.

What is especially interesting to me, however, is that the girls in his program did much better in mathematics than the boys; they were the most active in the math clubs, taking the initiative and the responsibility to a much greater extent, and performed better on the standardized exams. Unfortunately, that the girls excelled in math was attributed, as is the general leadership role played by Palestinian women, at least by some, both to a form of neglect of the girls which allows them the freedom to develop and to an essential breakdown of the societal traditions under the prolonged disruption of war, exile and military occupation. That is hardly a prescription for the achieving of mathematical equality.

NOTES

Dr. Judith M. S. Prewitt, Division of Computer Research and Technology, National Institutes of Health, was recently elected Fellow of the IEEE (Institute of Electrical and Electronics Engineers). Only about 1% of the members of IEEE are Fellows, and only .3% of this percent are women. Congratulations!

Phyllis Chinn has completed a revised and expanded Women in Science and Mathematics Bibliography, copyright 1980. Copies of this 44 page bibliography are available for \$3.00 from Humboldt State University Foundation, Humboldt State University, Arcata, California 95521. Books and articles listed include biographies and autobiographies of

women scientists, studies of differences between the sexes as related to scientific or mathematical abilities, studies and programs designed to increase the participation of women in science, characteristics of and other information regarding women as scientists, and articles concerning women and technology.

Some of our membership is not convinced by Jonathan Cole that "Fair Science" is all that fair. Dr. Lakshmi Sanga writes of the difficulties her sister, a Ph.D. in Math, has had finding employment, both here and in India. She concludes:

"With experiences like these one may wonder if it is worth one's while to go for the difficult, though fascinating and interesting, disciplines of mathematical sciences, or even encourage both men and women students to pursue these studies; especially for a women it seems like it is easier to get a job as an accountant or bookkeeper."

From *Time*, November 17, 1980: DIETZ, Elizebeth Smith Friedman, 88, cryptographer and co-author of the 1957 book The Shakespearean Ciphers Examined, in which she and her husband William used modern statistical methods of linguistic analysis to dispute the theory that Sir Francis Bacon was the secret author of Shakespeare's plays; of arteriosclerosis; in Plainfield, N.J. Learning code-breaking during World War I at the U.S. Government's Riverbank Laboratories in Geneva, Ill., Friedman served as an expert witness in such trials as the so-called Doll Woman Case of 1944, in which an antique doll dealer in New York City was convicted of spying for Japan.

Does anyone know anything else about her?

From J. Wick Pelletier, York University:

At the 56th Ontario Mathematics Meeting held at York University, Toronto, on Saturday, November 15, 1980, a special session in Analysis was arranged in honour of the 65th birthday of Lee Lorch [Ed.: long-time friend and member of AWM]. Speakers at this session were: R. G. Rooney (Toronto), P. R. Beesack (Carleton), H. Heinig (McMaster), C. Billigheimer (McMaster), A. Jakimovski (Tel-Aviv), A. P. Guinard (Trent). An invited lecture was given by Donald J. Newman (Temple), long-time friend and associate of Lee Lorch. A special luncheon and an afternoon reception helped to make the occasion an enjoyable event.

AWM EXECUTIVE COMMITTEE, 1981

Donna Beers has been reelected Treasurer, and Bettye Anne Case and Judith M. S. Prewitt have been elected Member-at-Large. Congratulations!

A report on the Executive Committee meeting at the Joint Meetings in San Francisco will appear in the next Newsletter.

Bhama Srinivasan, President, Dept. of Math, University of Illinois at Chicago Circle
Judith Roitman, Past President, Dept. of Math, University of Kansas
Donna Beers, Treasurer, On leave from Wellesley College; Dept. of Math, New Mexico State University
Anne Leggett, Newsletter Editor, Dept. of Math, Western Illinois University
Martha Jaffe, Clerk, Dept. of Math, Boston State College
Bettye Anne Case, Member-at-Large, Dept. of Math, Tallahassee Community College
Louise Hay, Member-at-Large, Dept. of Math, University of Illinois at Chicago Circle
Rhonda Hughes, Member-at-Large, Dept. of Math, Bryn Mawr College
Joan Hutchinson, Member-at-Large, Dept. of Math, Smith College
Judith M.S. Prewitt, Member-at-Large, Division of Computer Science and Technology, National Institutes of Health

BEFORE AWM

by Alice T. Schafer, Wellesley College
talk given at AWM Panel, San Francisco, January 9, 1981

When President-elect Bhamu Srinivasan asked me to give a short talk on the "past" at this celebration of the tenth anniversary of AWM, she suggested that instead of "past" referring to the history of AWM that I talk about the past which made the founding of the Association for Women in Mathematics inevitable. I am defining "past" to be the twentieth century to 1970, except that to bring the past into the twentieth century I want to mention a little of the story of an American woman mathematician whose career spanned a period beginning in the nineteenth century and ending in 1930.

Christine Ladd, later Ladd-Franklin, (1848-1930), an 1869 graduate of Vassar College, wanted to be a physicist but changed to mathematics when she learned that women were not allowed to work in laboratories. When Johns Hopkins University, founded in 1876, announced a fellowship program in mathematics she applied under the name of C. Ladd. Her credentials were superb and she was admitted. When she arrived and the Board of Trustees realized that she was a woman, her fellowship was revoked. Through the influence of James J. Sylvester, then at Hopkins, her fellowship was reinstated, but the Trustees stipulated that her name not appear on the University's list of fellowship holders. When she completed the work for the Ph.D. degree, the Board of Trustees refused to award her the degree on the grounds that a precedent might be set. Soon afterwards she and her husband went to Göttingen University to continue their studies of mathematics, only to find that women were not allowed to attend lectures. It was at this time that she became interested in psychology. A member of the Göttingen faculty recognized her abilities and offered to let her work in his laboratory. In 1909 she became a member of the psychology faculty at Columbia University. While at Columbia she was invited by the Psychology Department of Harvard University to give a lecture at that University. After she had accepted the invitation, the President of Harvard learned that a woman had been invited to speak at the University. He informed the Psychology Department that the invitation must be withdrawn. When Ladd-Franklin was notified of this, she wrote that unless she received a personal letter from the President, she was coming anyway. She received no such letter and came to Cambridge and gave her lecture. It seems that discrimination did not discriminate among fields. Forty-four years after her work for the Ph.D. degree was completed, Hopkins awarded her the degree. She was 78 years old at the time, and the year was 1926.

By the 1920's women in this country were receiving approximately 6% of the doctorates awarded in mathematics, a figure that remained relatively constant until the beginning of the 70's. Women could attend graduate schools at all of the universities with good research departments in mathematics except Princeton University, which did not admit women to its graduate program in mathematics until the late 60's. Although women could attend other graduate departments of mathematics, life was not always easy once they gained admission. For example, at Harvard some professors refused to allow women to sit in their classrooms. They were, however, allowed to sit in chairs placed just outside the classroom doors so that they could hear the lectures.

Until the 1970's the employment situation remained much as Anna Pell Wheeler, whom AWM honored at the Ann Arbor meetings last summer, described in a letter written in 1910, soon after she received her Ph.D. degree from the University of Chicago: "I had hoped for a position in one of the good universities like Wisconsin, Illinois, etc., but there is such an objection to women that they prefer a man even if he is inferior both in training and in research. It seems that Professor E. H. Moore [her thesis advisor] has also given up hope for he has inquired at some of the Eastern Girls' Colleges and Bryn Mawr is apparently the only one with a vacancy in mathematics." Women mathematicians found employment mainly at the women's colleges and small liberal arts colleges where salaries were low, teaching loads heavy, and where there was little or no money for help with paper grading. Seldom were there funds for sabbaticals or for travel to

professional meetings. At these institutions, duties having no connection with teaching were often required of the women members of the faculty; for example, living in the dormitories, acting as advisors to students and student groups, and even teaching Sunday School. The result was that there was little time for research and little money for travel to centers of mathematical research.

As women students moved through their courses of study, they saw fewer and fewer women as classmates or instructors in mathematics courses. Except at the women's colleges, women frequently received little or no encouragement to continue their mathematical studies, little or no knowledge of possible careers in mathematics or in fields that use mathematics, and had little or no contact with women mathematicians. There is ample evidence that women role models are important. Therefore, it is not surprising that many women who early in their schooling had shown an affinity for mathematics and a commitment to pursue the study of mathematics were soon discouraged from doing so because of knowing little or no precedent for the serious participation of women in mathematical activities.

Women were as invisible in other parts of the mathematical community as they were on the faculties of universities. Seldom did women's names appear on the lists of officers of the American Mathematical Society or the Mathematical Association of America, or on membership lists of committees of the AMS and the MAA, which committees might be policy setting groups for those organizations. Seldom did women's names appear on the lists of invited speakers at meetings of the AMS or the MAA, on lists of colloquium speakers at universities, or on the lists of editors of research journals in mathematics. By 1970 only one woman had delivered the AMS Colloquium Lectures (in 1927). Seldom were women's names on lists of holders of prestigious fellowships. The National Science Foundation listed no women mathematicians as program directors. In 1970 in the five mathematics departments considered by mathematicians to be the leading ones in the country no woman had tenure. [By 1980 there were three. In the report on the status of women in the sciences prepared for the National Research Council and published in 1979, it was reported that in 1975-76 at the 25 institutions in the country which receive the largest amount in federal expenditures for research and development the number of women on the mathematics faculties at the rank of associate or full professor was 13 in 1975-76, while the number of men at those institutions in those ranks was larger than 500.]

It was clearly time for a change. By 1970 some women mathematicians were talking openly about discrimination faced by women in the mathematical community. In the Boston area women mathematicians and women graduate students in mathematics were meeting to discuss common problems and possible solutions. In January 1971, at a meeting of the American Mathematical Society in Atlantic City, Mary W. Gray of American University and a group of women attending that meeting decided to form an association with the purpose of improving the status of women in the mathematical community to ensure that women will have the same opportunities in mathematics as men. The Association for Women in Mathematics had been founded.

LATE ENTRY ACCELERATED PROGRAM

In a new two-year graduate program at Boston University, thirty women will participate in the Late Entry Accelerated Program (partially supported by NSF). Requests for applications are now being accepted for this program designed to train women with bachelor's degrees in physics, chemistry, mathematics or engineering for careers in computer science and engineering. LEAP will begin in mid-May with a week's orientation and a core course to introduce participants to computer science and engineering. There will also be preparatory courses in mathematics, physics or engineering. The preparatory segment of the program will be completed in August, 1982. Students will then divide along elective pathways and earn a nine-months master's degree in May, 1983. Contact Sonia Parker, Boston University, College of Engineering, 110 Cummington St., Boston, MA 02215, (617) 353-2800.

NCTM RECOMMENDATIONS FOR SCHOOL MATHEMATICS OF THE 1980s

An agenda for action:

1. Problem solving must be the focus of school mathematics in the 1980s.
2. The concept of basic skills in mathematics must encompass more than computational facility.
3. Mathematics programs must take full advantage of the power of calculators and computers at all grade levels.
4. Stringent standards of both effectiveness and efficiency must be applied to the teaching of mathematics.
5. The success of mathematics programs and student learning must be evaluated by a wide range of measures than conventional testing.
6. More mathematics study must be required for all students and a flexible curriculum with a greater range of options should be designed to accommodate the diverse needs of the student population.
7. Mathematics teachers must demand of themselves and their colleagues a high level of professionalism.
8. Public support for mathematical instruction must be raised to a level commensurate with the importance of mathematical understanding to individuals and society.

An Agenda for Action: Recommendations for School Mathematics of the 1980s may be ordered from the National Council of Teachers of Mathematics, 1906 Association Drive, Reston, VA 22091. Copies are \$1.00 each (individual members only \$.80), prepaid. The booklet contains detailed recommended actions in each of the above eight areas.

NIE GRANTS

Grants for research on Mathematics Learning are expected to be awarded for Fiscal Years 1982 and 1984. The official initiating mechanism for each competition is a Grant Application Notice published in the Federal Register. Potential applicants should look for such notices. Applicants may also contact the Institute in February of each year for information on dates. First expected deadline: October, 1981.

Competence in mathematics, like competence in reading and writing, is fundamental to many areas of study and work. Yet to many, mathematics represents a formidable barrier to entering the world of technical knowledge and skills. NIE supports research on the nature and development of the conceptual and cognitive processes that are involved in learning, understanding, and doing mathematics. Priority is given to studies that add to our knowledge of how adults, youth, and children learn mathematical concepts and perform mathematical tasks at the precollege level, and to studies that contribute to a deeper understanding of difficulties that learners have in performing tasks, particularly as those difficulties influence the educational opportunities of women, the economically disadvantaged, and members of minority groups. To date, work in this area has emphasized mathematical concepts and skills as presented in school contexts. In addition to further work of that kind NIE encourages studies of the use and acquisition of mathematical skills and concepts in other settings, such as the workplace and the home.

Since all applications will be reviewed by persons from a variety of professional backgrounds--mathematicians, mathematics educators, psychologists, and teachers--they should be written so that they will be understandable to persons from these different backgrounds. Successful applications must meet the standards of behavioral scientists and of reviewers with mathematical and teaching backgrounds. To that end, NIE encourages collaboration among mathematicians, mathematics educators, psychologists and teachers. Because the aim of this program is to support research that will ultimately result in the improvement of practice at the local level, all applications for research on the following topics in mathematical learning must show evidence that the applicant understands the

practical issues in mathematics instruction to which the study is potentially relevant.

1. The nature and development of mathematical problem-solving and reasoning abilities.

The following are examples of studies for which awards might be made:
studies of how persons solve or learn to solve mathematical problems whether expressed in written form or not;
studies of how persons recognize situations in which they can apply mathematical knowledge that they have already acquired;
studies of the nature and development of "mathematical maturity," and the ability to extract meaning from mathematical prose;
studies of sociological, socioeconomic, and individual differences in the development of mathematical abilities such as those listed above.

2. Development of mathematical concepts in children and adults. Awards will be made for studies, including comparative studies, that analyze the nature and development of mathematical concepts normally associated with the pre-college curriculum.

Examples are:

studies of the development of concepts and cognitive processes that are relatively specific to a particular area within mathematics, e.g., arithmetic, geometry, probability, combinatorics;
studies of the development of more general mathematical concepts and cognitive processes, e.g., concepts of function, relation, equivalence, invariance, implication, and logical quantification;
studies of sociocultural, socioeconomic, or individual differences in the development of mathematical concepts and processes;
comparisons of techniques for improving learner's mathematical abilities and understandings of mathematical concepts. (Such studies must include analyses of underlying causes of the differences in effectiveness.)

3. Analyses of mathematical tasks. Awards will be made for research that analyzes mathematical tasks encountered in and out of school settings. Such analyses might be undertaken as a preliminary step for future work in research, curriculum development, test construction and the like. Examples are:

analyses of tasks encountered in intermediate grades, e.g., measurement tasks, tasks involving operations on rational numbers, and the solution of simple linear equations;
analyses of tasks from the later pre-college grades, e.g., factorization of polynomials, construction of deductive proofs in some limited domain;
analyses of tasks encountered outside of mathematical classrooms in school and non-school settings that, nevertheless, have a mathematical component, particularly tasks related to non-professional and non-technical jobs.

NIE encourages the submission of small grant applications (up to a maximum of \$15,000 total costs for studies of twelve months or less). Program officer contact: Panel Officer, Mathematics Studies Team, Division of Learning and Development, National Institute of Education, Washington, DC 20208. (202) 254-6572.

REMEDIAL MATHEMATICS CONFERENCE

"The problems are growing faster than the solutions."

This is how a professor from Clearwater, Florida described the field of mathematics remediation today. As a step toward finding solutions, The City University of New York is sponsoring a national conference. The City University of New York Instructional Resource Center (in cooperation with Networks and CUNY Mathematics Discussion Group) announces the conference "Remedial and Developmental Mathematics in College: Issues and Innovations" to be held Thursday, April 9 through Saturday, April 11, 1981, Hotel Roosevelt, New York City. Plenary speakers will include: K. Patricia Cross, author of Beyond the Open Door and Accent on Learning, Harvard Graduate School of Education; Fred Hechinger, author and educator, education columnist for The New York Times; Peter

Hilton, Beaumont Professor of Mathematics at Case Western Reserve University, Secretary of the International Commission on Mathematics Instruction. Presentations will cover objectives, placement procedures, content, teaching strategies, support services, testing, and evaluation.

Registration Fee: \$85. Early Registration (before March 20, 1981): \$80. Registration includes conference materials, attendance at all events, two lunches and one breakfast. For information and registration forms, please write to: Dr. Geoffrey Akst, Conference Chair; The City University of New York; Instructional Resource Center; 535 East 80th St.; New York, NY 10021.

CRITICAL FILTERS IN SCIENCE CAREERS

by Bonnie B. Spanier, Research Associate, Bunting Institute 1978-80
reprinted by permission from Choices for Science, Proceedings of Symposium
sponsored by the Mary Ingraham Bunting Institute of Radcliffe College,
Marion Kilson, Director

I will start by reading a poem by Adrienne Rich called "Planetarium." She is thinking of the English astronomer Caroline Herschel, who was born in 1750 and lived to be 98 years old, and of other women astronomers, such as Sophia Brahe, a Dane who lived in the 16th century. Sophia Brahe's brother, Tycho, is also mentioned in the poem; he was the very famous astronomer who said he counted the stars so that posterity would have fewer to count.

Planetarium

A woman in the shape of a monster
a monster in the shape of a woman
the skies are full of them

a woman 'in the snow
among the Clocks and instruments
or measuring the ground with poles'

in her 98 years to discover
8 comets

she whom the moon ruled
like us
levitating into the night sky
riding the polished lenses

Galaxies of women, there
doing penance for impetuosity
ribs chilled
in those spaces of the mind

An eye,
'virile, precise and absolutely certain'
from the mad webs of Uranisborg
encountering the NOVA

every impulse of light exploding
from the core
as life flies out of us

Tycho whispering at last
'Let me not seem to have lived in vain'

What we see, we see
and seeing is changing

the light that shrivels a mountain
and leaves a man alive

Heartbeat of the pulsar
heart sweating through my body

The radio impulse
pouring in from Taurus

I am bombarded yet I stand

I have been standing all my life in the
direct path of a battery of signals
the most accurately transmitted most
untranslatable language in the universe
I am a galactic cloud so deep so involu-
tuted that a light wave could take 15
years to travel through me And has
taken I am an instrument in the shape
of a woman trying to translate pulsation
into images for the relief of the body
and the reconstruction of the mind.

1968

This poem embodies for me the hopes and aspirations of humans, of women, to have free choices: the desire to be themselves, to be scientists, if they want. The first line, "a woman in the shape of a monster," evokes the psychological terrors of deviance within society.

The end of the decade of the '70's saw the percent of Ph.D.'s granted to women finally come up to the level that it was in the 1920's. This shocking fact, the halt and reversal, after the 1920's, of the progressive increase seen 100 years ago, stands as a grim reminder of the ease with which society falls back (or is pushed back) to the old ways, which limit the freedom of particular groups of people.

Why do women represent only 10% of all Ph.D.'s in science and engineering, with great variation of participation in the different fields, ranging from 17% of Ph.D.'s in biology down to 7% in math and in chemistry, 3% in physics, and 1% in engineering?

Dr. Hughes has described some of the key factors in the early stages of education and training that limit access to the physical sciences; mathematics plays a crucial role. The situation in biology and psychology, in which women participate to a much greater extent, is less severe. One of the many factors contributing to this is that much less math is required in these fields.

What are the other factors that act as critical filters for women entering science and developing as scientists? They are numerous, complex and intertwined. I will only touch on some of them.

The major factor is outright discrimination in hiring and advancing women through the scientific system. Let us focus on academe. Women are concentrated in the lower

ranks, are not advanced as rapidly, are not given tenure, are paid lower salaries, and are concentrated in the less prestigious, less research-oriented institutions. Women are under-represented in the regular (tenure-track) faculty at research universities, particularly in the elite Ivy League Schools. Gerty Cori, who shared the Nobel Prize with her husband, was a research associate, the holder of a non-tenurable position, for 16 years (at about 10% of her husband's salary), while her husband rapidly advanced to full professor at Washington University in St. Louis. Gross discrimination does not belong in the far distant past; only a decade ago, in 1969, there were no women among the 400 tenured faculty at Harvard.

Now, at the start of the 1980's, when affirmative action has some influence, colleges and universities have few tenurable positions open to anyone. As many have noted, the recent women's liberation movement came about ten years too late for most women to reap benefits from the rapidly expanding economy of the 1960's.

Vera Kistiakowsky, in her article in Physics Today, organizes the many possible reasons for the under-representation of women in physics into several major categories, and I will apply these to women in the sciences and math in general. In addition, then, to overt discrimination, Dr. Kistiakowsky cites: 1) the "Matthew effect", 2) family and career conflict, and 3) the environment.

The phrase "Matthew effect" was coined by the sociologist Robert Merton, from the Bible quotation of Matthew: "For unto everyone that hath shall be given and he shall have abundance; but from him that hath not shall be taken away even what he hath" (Matt 13:12). The "Matthew effect" simply points out that a greater share of recognition and reward for scientific work comes to scientists with established reputations and leadership positions at research universities as compared to lesser known scientists. Thus, success rapidly breeds success in science as in other human endeavors. The characteristics making this more striking in science are the expense of scientific research today and the importance of the informal communication and professional network. It becomes easier, then, for well-known scientists to get grants and graduate students; these, in turn, increase the quality, number, and scope of publications coming out of that scientist's lab, thus attracting more grants, the brightest students and perhaps awards. Women are most often outside the inner circle, in secondary positions (in which they cannot obtain their own grants), or at less prestigious institutions, which have less money for research. Since women are at institutions and in positions that require more teaching, they have less time and motivation to do research, and less help from graduate students, post-doctorate fellows, and technicians, who do most of the actual work in science.

The importance of access to the inner circle is linked to another significant factor influencing success in science. That is the supportive function of the mentor, an older, established scientist, whose recommendation can issue the newcomer into the inner circle and who stands behind the younger scientist along the career path: graduate school, post-doctoral research, assistant professorship up through tenure. Well-meaning letters of recommendation written for women often include comments about their demeanor and psychological state, while omitting any statement about their potential as young scientists. Low expectations of a woman in science are reflected in this striking absence of any judgment about her scientific development and future contributions in her field.

A crucial function of the mentor and the "old boy" network is to label the new scientist (brilliant, promising, technically good but dull) without having to spend time actually assessing performance. People often assume that it is easy to judge a scientist's work or potential because of the presumed objectivity of science. Both the objectivity and the ease of judgment are overrated. Counting the number of publications of a scientist does not tell you anything about the quality or the significance of the work itself. Therefore, the scientific community, as any other community, bases the reputation of the newcomer upon the reputation of the mentor, and the "old boy" network determines who is the "best" candidate for a job.

Women scientists are breaking into the inner circles (in some fields) and learning how to use the system to their own advantage. More importantly, they are mobilizing

their own networks and professional groups for support and increased visibility, groups such as American Women in Science.

Science is characterized in our culture at this time as a "masculine" endeavor, and it certainly is a male-dominated one. For both men and women scientists, most of the role models have been men. Women who have gone into science, particularly since the 1950's, have often been unaware of this; their role models have been seen at first simply as scientists. The degree to which women have ignored or not noticed that they are treated differently from their male colleagues is, I think, a testimony to their primary identification as "scientists" - no gender attached. For many, however, the absence of female role models eventually becomes a source of discouragement and of internal conflict. In the past, the impact of Marie Curie's fame on many girls was significant: "If she can do it, I can do it." Many highly motivated women went on for years without noticing what a rarity, a curiosity, Marie Curie was, or that her success has often been credited to her husband. This has been a common reaction to wife-husband scientific teams.

It is here, in the very powerful influence of role models on a women's entry and development in science, that one of the major strengths of women's colleges becomes apparent. Women's colleges are still unusual in having faculties in which women are present in proportions resembling the general population. Women's colleges have much better records for young women continuing successfully in the scientific profession, particularly in the physical sciences and math. The contribution of female role models who take themselves and their students seriously, contrasts with the effects of the relative absence of women on science faculties of research universities such as Harvard.

The dearth of female role models reaches an extreme in traditional studies of the history of science. Talented and exceptional women have done science in the past in different cultures and epochs. The history is there, waiting to be written, as some historians, mostly women, are finding to their delight.

Margaret Rossiter is now completing one volume of an extensive archival study of American Women in Science 1830-1940, which should be an excellent stimulus toward establishing a heritage for women in science today.

The major problem of integrating a career with family responsibilities is one which half of all females raising children in this country confront everyday.

This conflict is created for the most part by the culture's expectations that women take the full responsibility for raising children, either directly or indirectly, and is compounded by the lack of good and inexpensive childcare facilities. In addition, the psychological conflicts arising from societal attitudes about motherhood and marriage can be considerable, although some women say that the problem loomed larger in their imagination than in reality. Historically, women around the turn of the century who were committed to their work in science often did not marry. Those who did, increasingly through this century, often married scientists with whom they worked. Many did not have any children. Now, studies show that women scientists with one or two children may publish as much or more than their male colleagues.

Today, the special problems of a scientific career are created mainly by the rigid time sequence of the career path, which requires the greatest time and energy commitment during the years considered safest for childbearing - that, is, up to age 35. Women's problems are also compounded by the erroneous belief that science cannot be done on a part-time basis.

Thus, the traditional scientific career (as most academic careers) is inherently discriminatory against women. It also discriminates against the increasing number of men who want to share in raising their children. It has not escaped notice that many successful male scientists, in their dedication to their work and careers, cut themselves off from their families' lives.

The spectre of the family-career conflict imposes both external and internal limits on women, if they themselves accept the either/or dilemma. There is one particular "catch-22" that still fosters covert discrimination: the assumption that it is a waste of time, energy and money to train women as scientists because they just go, get married, have children and never use their training. This is simply not true today.

Studies of recent (1960's and '70's) bachelor's and master's degree holders in science and engineering indicate that, of these, 85% of the women and 88% of the men were part of the labor force in 1974. Thus, women recently trained in science were, in 1974, working or seeking work in the same proportions as the men. That is a very significant piece of information. (Unfortunately, the studies show that, compared to men, women's unemployment rates are higher, their salaries are lower, and they are less likely to be employed in their field or in science.)

What these studies indicate, as reported by Betty Vetter in Science magazine, is that women trained in science and engineering are strongly dedicated to continue working, and participation increases to 95% among women with doctorates. Women with young children, if they leave the work force at all, are returning to work much sooner than in the past.

Women are clearly demonstrating their commitment in science. A commitment is now required from our society to expand opportunities for equal participation, not just in numbers but in fields of choice, salary and status. Making short career interruptions and reentry a matter of course, increasing the flexibility of the tenure track, supporting part-time graduate and post-doctoral work, and increasing the opportunities, status and pay for part-time work in science in all sectors - academe, government and industry - would alleviate many family-versus-career problems for both women and men.

The term "environment" encompasses a wide range of factors that influence an individual's potential or actual scientific career. Cultural messages about appropriate roles for women are confusing, contradictory and still strongly rooted in the confining stereotypes of woman as wife and mother. The fact that women are working in greater numbers than ever to support themselves and their families tends simply to add one more responsibility without reorganizing and sharing others. The emergence of the "superwoman" has shifted unrealistically low expectations of women to unreasonably high ones.

These societal messages, confusing and self-defeating as they are, are heard by women and men alike, and generate what are termed the internal (in the women themselves) and external (in society in general) psychological barriers which contribute substantially to the low participation of women in the sciences. It should be no surprise that denigrating attitudes towards women - low esteem, expectations, motivation and confidence - are internalized by women themselves. According to Vetter's article: "Commenting on the passive and dependent role assigned to women by societal values, one woman pointed out that 'This self-limiting expectation is a negative factor that must be overcome by constant internal struggle.'" (p. 34)

What are remedies for low self-esteem and expectations, solutions to both the fear of failure and the fear of success detected in women? The 1970's have witnessed substantial change in women's attitudes and behavior. The term "consciousness-raising" may be a cliché by now, but underlying that term is an experience which prods awareness and often awakens a new view of life and its potential for the individual.

However, there is considerable resistance among women scientists (especially the successful ones) to identifying themselves as women and to admitting that they have experienced any discrimination. This is often a source of disappointment to younger women who turn to their few female role models for support and insight on coping mechanisms.

The last problem I will mention is the attitude that women are less successful in science than men because they are innately less suited to the rational, objective, creative work of good science. Few people state the notion outright, but it is implicit in the opinion that the negative influences on women could not account for their low participation in science. I propose that, first of all, the assertion that science is rational, objective and "masculine", as opposed to intuitive, subjective and "feminine", is simply a fiction that does not stand up to close examination.

Second, all the research on sex differences, if analyzed closely, tells us nothing about possible innate differences in scientific ability (whatever that is), just as it has told us nothing about differences in intelligence between males and females (although

there is a long tradition of male scientists claiming objective, "scientific" proof of the inferior intelligence of women). However, the following statement from the Pulitzer Prize winning book On Human Nature by the eminent sociobiologist E. O. Wilson here at Harvard reinforces and legitimates society's prejudices: "Even with identical education for men and women and equal access to all professions, men are likely to maintain disproportionate representation in political life, business, and science." (p. 138) That is his opinion and there is no evidence to back it up, but he presents it as part of a powerful theory of human behavior.

This quick delineation of some of the negative influences on women's freedom of choice, in the context of the scientific professions, may sound very discouraging. It is crucial for us not to lose determination and vision. Obviously, many women have avoided, ignored, or overcome some of these problems. The situation in science is a little worse than in some fields, but a little better than in others.

I have heard it said that any woman who is a scientist is also a heroine. This is especially true because she did not set out to be a heroine; she only wanted to be a scientist.

I will close with a statement made by Dr. Mary Bunting, scientist, President Emerita of Radcliffe College and founder of the Institute for Independent Study, which is responsible for this symposium. She said:

I decided many years ago that I was far more interested in being a fact than in living anyone else's theory (p. 22).

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SCIENCE CAREER WORKSHOP

The Center for Women's Services at Western Michigan University encourages women to achieve their career goals, especially in nontraditional fields such as science and engineering. As part of its commitment, the Center will conduct a Science Career Workshop, June 5 and 6, 1981, on the campus of Western Michigan University, Kalamazoo, Michigan. The program will provide the information and methods for planning and developing careers in the: Mathematics and Computer Sciences, Social and Behavioral Sciences, Biomedical Sciences, Biological Sciences, Physical Sciences, Engineering, and Occupational Therapy. The major areas covered include:

Professional issues: educational planning, employment, and career changes and advancement

Personal issues: work alternatives, continuing education, psychological barriers, financial aid, and combining work with family responsibilities

Career opportunities: availability of positions, salary predictions, projected industry needs

This workshop is designed especially for women graduates and students who are:

currently majoring in the sciences or engineering

considering a change to a different science or engineering career

experiencing a break in their science or engineering careers because of home and family responsibilities

unemployed or underemployed in their desired field

For more information and application forms, write Science Career Workshop, Division of Continuing Education, Kalamazoo, MI 49008. Applications are due April 15, 1981.

OF POSSIBLE INTEREST

SIGNS: Journal of Women in Culture and Society, 4 issues per year, \$18.00. The University of Chicago Press, 11030 Langley Ave., Chicago, IL 60628. Goals: 1) to publish the new scholarship about women from both the United States and other countries, 2) to present a multiplicity of perspectives on both the lives of women and the social and cultural systems of which they have been a part, and 3) to illuminate--and improve--the institutions and culture to which we all belong. I find this journal to be generally well-written and thought-provoking and worth supporting.

The National Science Foundation Science for Citizens (SFC) Program invited proposals for projects intended to encourage scientists to participate in public activities aimed at the resolution of policy issues with significant scientific and technical aspects, and provide scientific and technical expertise to citizens and citizen groups so that they can better understand and participate in decisions on policy issues involving science and technology. (The deadline has already passed.) Forums, Conferences, and Workshops awards are made for the purpose of better informing community debates on policy issues that involve science and technology. Projects enable scientists and engineers, in conjunction with citizen groups, to plan and carry out public education activities on local or regional issues. Planning Study awards enable scientists and citizens to develop permanent community-based programs that can be responsive to continuing community needs for scientific information and advice on policy issues.

Women's Studies, Routledge & Kegan Paul, 9 Park St., Boston, MA 02108.

Longman Series in Feminist Theory. The Radical Future of Liberal Feminism; Sexuality and Politics; Reproductive Freedom.

Women's Studies, Greenwood Press, 88 Post Road West, Westport, CT 06881.

Women's Studies, Methuen, Inc., 733 Third Ave., New York, NY 10017.

A regional conference and art exhibition, "A Fabric of Our Own Making", Southern Scholars on Women, in Atlanta, Georgia, March 4-7, 1981, is an event designed to bring together in an academic forum the scholars/teachers, artists, students, and administrators who are concerned with educational equity for women in higher education. The conference is sponsored by the Women's Educational Equity Act Program of the U.S. Department of Education and by Georgia State University. The codirectors of the conference are Diane L. Fowlkes, political science, and Charlotte S. McClure, comparative literature, Box 673, Georgia State University, University Plaza, Atlanta, Georgia 30303.

The University of Minnesota and the Bakken Museum of Electricity in Life (BMEL), with support from The Minneapolis Foundation, are initiating a joint program of fellowships aimed at increasing the scholarly utilization of the library and scientific instrument collections of the BMEL whose strengths lie in the areas of the history of electricity, electrotherapy, electrophysiology, and bioengineering over a broad chronological period. Three levels of fellowship support are available: senior, junior, and graduate student. Applications or inquiries should be addressed to: Prof. Roger H. Stuewer, School of Physics and Astronomy, 116 Church St. S.E., University of Minnesota, Minneapolis, MN 55455. Deadline for Junior and Graduate Student Fellowship awards beginning in September, 1981 is March 15, 1981.

The Wilmar 8 is a film about 8 women who started the first bank strike in the history of Minnesota. California Newsreel Media at Work, 630 Natoma St., Rm. 101, San Francisco, CA 94103, (415) 621-6196.

La Partera: Story of a Midwife, by Fran Leeper Buss. University of Michigan Press' Women and Culture Series. University of Michigan Press, P.O. Box 1104, Ann Arbor, MI 48106.

Three regional seminars on Developing and Funding Reentry Programs for Women are being held March 20, 1981, Dayton, OH; April 10, 1981, Los Angeles, CA; May 1, 1981, New York, NY. This program will help you plan for an important student market of the 80's, develop a reentry strategy that suits your institution, work out a curriculum for reentry students, and immediately identify a source of funding through the minigrant program of the Women's Reentry Consortium. The program is supported by a grant from the Fund for the Improvement of Postsecondary Education and the National Science Foundation. Write: Women's Reentry Consortium, Box 83, Polytechnic Institute of New York, 333 Jay St., Brooklyn, NY 11201.

DEADLINES: Mar. 24 for May-June, May 23 for July-Aug., July 24 for Sept.-Oct.

ADDRESSES: Send all newsletter material except ads to Anne Leggett, Math. Dept., Western Illinois University, Macomb, IL 61455. Send everything else, including ads, to AWM, Women's Research Center, Room 204, Wellesley College, 828 Washington St., Wellesley, MA 02181.

JOB ADS

Institutional members of AWM receive two free ads per year. All other ads are \$10.00 apiece and must be prepaid. The vacancies listed below appear in alphabetical order by state. All institutions advertising below are Affirmative Action/Equal Opportunity employers.

University of California, Berkeley. Dept. of Statistics. Senior lecturer, beginning 7/1981: to manage statistical computing service, train doctoral students in consulting and teach statistics courses. Applicants need experience with such service and training, strong teaching experience and good record of applied and theoretical publication. By 3/15/81 contact Chmn Brillinger, Dept. of Statistics, Univ. of CA, Berkeley, CA 94720.

University of California, Davis. Dept. of Mathematics. One or two positions, Fall, 1981, in Computer Science. Candidates should be trained in computer science or in math with active interest in computer science. Level of appt. depends on qualifications. Required: Doctorate in comp. sci. or in related field with evidence of potential for research & teaching in comp. sci. Preferred: demonstrated competence in teaching at upper division & graduate levels. By April 15, 1981 send resume & 3 letters of recommendation to Carlos R. Borges, Chair, Dept. of Math, Univ. of CA, Davis, CA 95616.

University of California, Santa Barbara. Dept. of Mathematics. Several temporary, part or full time, teaching appointments in each of quarters during 1981-82 academic year. We encourage visitors with partial sabbatical or grant support. Acting research & teaching skills essential. Hope to acquire mathematicians & statisticians interested in interaction of math & statistics with other disciplines. Please write as candidly as possible concerning your circumstances, background & financial requirements to Prof. John Ernest, Chmn., Dept. of Math, Univ. of CA, Santa Barbara, CA 93106.

Emory University. Dept. of Math & Comp. Science. Tenure track Asst. & Assoc. Professorships beginning 9/1981. Required: strong research interests & promise of excellence in teaching. Candidate at Assoc. Prof. level should have proven research record. Prefer qualified candidates in areas of algebra, combinatorics, comp. sci., differential equations, dynamical systems, numerical analysis. By 3/15/81 contact Professor Henry Sharp, Jr., Chmn., Search Committee, Dept. of Math & Comp. Sci., Emory University, Atlanta, GA 30322.

Purdue University. Dept. of Mathematics. Possibly 3 regular or visiting appts. at Asst. Prof. level & 1 appt. at Assoc. Prof. level as of 8/1981. Exceptional research promise & excellence in teaching required. Send resume & 3 letters of recommendation to M. S. Baouendi, Head, Dept. of Math, Purdue Univ., West Lafayette, IN 47907.

Saint Mary-of-the-Woods College. Mathematics Dept. Asst. Professorship, tenure track. Mathematics education, introductory computer science, & mathematics courses at all levels. MA required; Ph.D preferred. By 3/31/81 contact Ellen Cunningham, S.P., Chairperson, Math Dept., Saint Mary-of-the-Woods College, Saint Mary-of-the-Woods, IN 47876.

Benedictine College. Dept. of Mathematics. (1) tenure track position teaching undergraduate math and (2) tenure track position teaching comp. sci. and/or mathematics and helping expand comp. sci. program utilizing PRIME 550. M.A. required for both; Ph.D. preferred. Strong commitment to undergraduate teaching & curriculum development essential. Send resume & 3 letters of recommendation to Jim Ewbank, Chmn., Dept. of Math, Benedictine College, Atchison, KS 66002.

Massachusetts Institute of Technology. Dept. of Mathematics, Cambridge, MA 02139. Asst. Professors will be appointed if sufficiently strong candidates can be found. Criteria are (i) superior ability as a research mathematician; (ii) demonstrated effectiveness as a teacher; (iii) 2 years or more of postdoctoral experience.

Massachusetts Institute of Technology. Dept. of Mathematics, Cambridge, MA 02139. Statistics: Possibility of opening for Instructor or Asst. Professors for Fall, 1981. Prefer Ph.D. in Statistics with interest in applications. Contact H. Chernoff for application forms and information.

Massachusetts Institute of Technology. Dept. of Mathematics, Cambridge, MA 02139. Applied Mathematics: limited number of postdoctoral instructorships. Appt. depends on basis of superior research potential, for a period not exceeding 2 years. Applications are considered & final decisions announced on or before 4/1/81. Write to Committee on Applied Mathematics, Room 2 - 345.

Massachusetts Institute of Technology. Dept. of Mathematics, Cambridge, MA 02139. C.L.E. Moore Instructorships are open to postdoctoral mathematicians with definite promise in research. Teaching loads 6 hrs. per week one semester and 3 hrs. per week the other. Appts. for 1 year. Academic year salary: \$18,600. For more information write to Pure Math Comm., Room 2 - 263.

Worcester Polytechnic Institute. Mathematical Sciences Dept. Tenure track Asst. Professorship in applied mathematics. Required: strong commitment to scholarship, excellent teaching, ability to interact with students & faculty of other disciplines. Prefer applicants whose interests parallel current work in dept., such as discrete modeling, mathematics of communication, applied analysis, differential equations, mathematical physics, statistics, & applied probability. Contact Paul W. Davis, Math. Sci. Dept., WPI, Worcester, MA 01609.

Michigan Technological University. Dept. of Mathematical & Computer Sciences. Limited term instructorship for which M.S. is required. Tenure track positions for which Ph.D. is required. Need people in numerical analysis, statistics, applicable math, other areas of mathematics & computer science. Candidates for tenure track positions should show evidence of strong research potential & teaching ability. Write Dr. William P. Francis, Acting Head, Dept. of Math & Comp. Sci., Michigan Technological University, Houghton, MI 49931.

University of Michigan, Dearborn. Dept. of Mathematics & Statistics. Tenure track Asst. Professorship starting Sept., 1981. Prefer candidates with applied mathematics background. Both teaching & demonstrated research capability required. Teaching load: 9 credit hours per semester. Send resume & have 3 letters of recommendation sent to Univ. of Michigan, Dearborn, Dept. of Math & Statistics, 4901 Evergreen Rd., Dearborn, MI 48128.

University of Minnesota, Duluth. Dept. of Mathematical Sciences. Tenure track Asst. Professor to teach 6-8 hrs/wk in an undergraduate computer science program & conduct research. Required: Ph.D. in Comp. Sci., Math or related field & significant experience in comp sci. \$25,000+ (9 mo.) starting 9/1/81. Send application, resume, transcripts, & 3 letters of recommendation by 3/15/81 to Mark Luker, Math Sci. Dept., University of Minnesota, Duluth, MN 55812.

Rutgers University. Department of Mathematics. Possible tenure track Asst. Professorship. Ph.D. in mathematics, strong research credentials & active interest in quality teaching. Comp. sci. experience desirable. Competitive salary & wide range of benefits. Send application & 3 letters of reference to Edward S. Boylan, Chmn., Dept. of Math, Rutgers University, 101 Warren St., Smith Hall, Newark, N.J. 07102.

SUNY, Geneseo. Dept. of Mathematics. Instructor/Asst. Professorship, Fall, 1981, to teach 12 hrs. 2 year appt. Required: Ph.D. or nearly completed Ph.D. Broad mathematical background with proven teaching expertise for undergraduate instruction at all levels. Areas: algebra, applied mathematics, numerical analysis or statistics. Rank and salary (from \$14,500) determined by degree status, experience & qualifications. By 3/23/81 send vitae & inquiries to Donald W. Trasher, Chmn., Dept. of Math, State University College, Geneseo, N. Y. 14454.

Vassar College. Dept. of Computer Science. Tenure track Assoc. of Full Professorship beginning 8/15/81. Required: Ph.D. or equivalent in Comp. Sci. or related field, distinction in scholarship & teaching; academic administrative experience an asset. Duties: undergraduate teaching & curriculum development. Reply to Professor Winifred Asprey, Dir., Computer Center, Vassar College, Box 13, Poughkeepsie, New York 12601.

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