Association for Women in Mathematics

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Volume 18, Number 3 NEWSLETTER May-June 1988

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PRESIDENT'S REPORT

As most of you are sadly aware, Israel N. Herstein of the University of Chicago died in February. Deeply respected as a mathematician, teacher, and author, Professor Herstein was a long-time friend and supporter of AWM. His former Ph.D. student, Martha K. Smith, will share her remembrances of Professor Herstein in the next issue of the *Newsletter*.

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Thanks to those of you who sent me the Boston *Globe* article "Study: Boys, girls about equal in learning math" from the February 14, 1988, issue. The article describes research of Gila Hanna that was presented at the AAAS meeting in Boston in February. 74,000 adolescents in twenty nations were given a battery of tests, with the result that in half the countries, there were no gender differences in mathematics achievement. In the remaining countries, boys did better in tests on geometry and measurement, while girls excelled in algebra, although even the largest differences were very small. This study and the attention it has received is a welcome antidote to the unbalanced picture the public is usually given about girls and mathematics. It has been surprisingly difficult to persuade the press that girls' success in mathematics makes good news. The charge of our new Committee on the Public Image of Women in Mathematics is to counter this bias on the part of the media (volunteers still needed, and welcome!).

AWM has submitted a proposal to the National Science Foundation requesting funds to support travel by women to research conferences. Members will be kept posted on the status of our proposal.

* Congratulations to: recipients of Fulbright awards for 1987-88, listed on page three;
Andrea Bertozzi, who won first prize in the second annual Courant Institute competition for mathematical talent; and
Ashley Reiter of North Carolina, who won the oral competition at the MATHCOUNTS competition last spring (information supplied by John Dossey, President, NCTM).

Providence. Bettye Anne Case had the inspired idea of producing a souvenir pamphlet for the AMS Centennial, containing pictures, abstracts and biographical sketches of the Emmy Noether Lecturers (our way of celebrating women in American Mathematics). Lori Kenschaft is working on the project, and if all goes as planned, you'll see the end result in August.

The schedule of AWM activities in Providence, all on Tuesday, August 9th, is as follows:

Business Meeting: 7:30-7:55 P.M.
Panel Discussion (Centennial Reflections on Women in American Mathematics):
8:00-9:30 P.M.
Party: 9:30-11:00 P.M.

Details will appear in the next issue of the *Newsletter*.

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MOMENT MAPS IN STABLE BUNDLES: WHERE ANALYSIS, ALGEBRA AND TOPOLOGY MEET

remarks taken by K. Uhlenbeck from the 1988 Noether Lecture

This is a time of finding interrelationships within mathematics. Or more bluntly, it is fashionable to study mathematical problems encompassing many areas of mathematics. This pleases me. As a student I had many crushes on various mathematics subjects, but sequentially. Now I can study them all at once.

The gauge-theoretic study of stable holomorphic bundles on complex Kähler manifolds is a prototype of such crossroads. The subject of stable bundles is treated as an infinite-dimensional example of geometric invariant theory (as formulated by Mumford). Symplectic geometry plays an important role. The equations for the moduli space are the Yang–Mills equations (from physics). The group is the same gauge group from Yang–Mills, and the topology on the moduli space is studied via Morse Theory for the Yang–Mills functional.

A careful count includes not only analysis, algebra, and topology, but geometry and physics to boot! There is probably some number theory hidden somewhere in the second application below.

Moreover, the list of possible applications is formidable. Best known are probably Donaldson's uses of these Yang–Mills moduli spaces to construct invariants of smooth compact four-dimensional manifolds. Nearly as important are the calculations of Atiyah–Bott on the topology of moduli spaces for stable bundles over curves. Corlette has used this machinery to classify flat bundles, and Simpson has employed it to study Hodge Structures. Atiyah and Hitchin have studied the interaction of magnetic monopoles (those things astronomers seem to think may exist). One can always guess this might be useful for string theory, which seems to be able to absorb every kind of mathematics.

This is a lot of mathematics! Our graduate courses are not really designed to teach it, but graduate students seem to manage (better than me in fact) to absorb the necessary ideas. May I encourage more young women to try it. It is (comparatively) a woman's field. The list of references I include has a number of basic papers by women in it.

I am sorry to leave the colorful slides out of the description of the talk, as well as the few mathematical concepts which were given. There is no good introductory survey. Perhaps I will find time to write a longer one sometime. None of the references is particularly expository.

References

M. Atiyah & R. Bott, *The Yang-Mills equations over Riemann surfaces*, Phil. Trans. Roy. Soc. London A, **308**(1982), 523-615.

M. Atiyah & N. Hitchin, *Geometry and dynamics for magnetic monopoles*, Princeton University Press (to appear in March).

K. Corlette, *Gauge theory and representations of Kähler groups*, preprint, University of Chicago.

S.K. Donaldson, *Anti-self-dual Yang-Mills connections over complex algebraic surfaces and stable vector bundles*, Proc. London Math. Soc. **50**(1985), 1-26.

__________, *Infinite determinants, stable bundles and curvatures*, Duke Math. J. **54**(1987), 231-247.

N. Hitchin, *The self-duality equations on a Riemann surface*, Proc. London Math. Soc. **55**(1987), 59-131.

G. Kempf & L. Ness, *The length of vectors in representation spaces*, "Algebraic Geometry," Proceedings Copenhagen (1978), Springer Lecture Notes in Mathematics **732**(1982).

F. Kirwan, *Cohomology of quotients in symplectic and algebraic geometry*, Princeton Mathematical Notes **31**(1984).

S. Kobayashi, *Differential geometry of complex vector bundles*, Princeton University Press (1987).

L. Ness, *A stratification of the null cone via the moment map*, Amer. J. Math. **106** , 1281-1330.

C. Simpson, *Systems of Hodge bundles and uniformization*, Thesis, Harvard (1987).

K. Uhlenbeck & S.T. Yau, *On the existence of Hermitian Yang-Mills connections*, Comm. in Pure and Appl. Math. **34**(1986), S257-S293.

NOTE FROM THE EDITOR

My thanks to Karen for the summary above of her Noether lecture. I would like to invite the rest of you to submit short articles of a mathematical nature. Expository notes about important new results/trends would be especially appropriate.

For those of you who operate in the PC rather than the mainframe computer world, mail will be forwarded to me from the following Compuserve address: 73240, 2051.

HONORS AND AWARDS

Congratulations to the following, who have been awarded Fulbright grants, 1987-1988: Christine W. Ayoub, professor of mathematics, Pennsylvania State University: Morocco; Elizabeth D. Behrens, associate professor of mathematics and business administration, Hastings College, Nebraska: Malawi; Rebecca Dersimonian, assistant professor of epidemiology and public health, Yale University: USSR; Carol N. Harrison, assistant professor of mathematical sciences, Susquehanna University: Liberia; Marialuisa N. McAllister, professor of mathematics, Moravian College: Italy; and Patricia Sipe, assistant professor of mathematics, Smith College: Chile.

More than 900 scholars, academics, and professionals have received awards under the Fulbright Scholar program to travel, lecture, consult and conduct research abroad in 1987-1988. Twenty-five of those selected are in the fields of mathematics and computer science. The Council for International Exchange of Scholars cooperates with the United States Information Agency in administering the Fulbright program.

CIES has announced that a number of 1988-1989 Fulbright Grants remain available in the field of mathematics. For information contact CIES, Eleven Dupont Circle NW, Suite 300, Washington, DC; 202-939-5401.

LETTER TO THE EDITOR

Here we go again, and in the AWM *Newsletter* no less. I am referring to the conference report on GASAT IV (Girls And Science And Technology) where we learn that girls "often do neater and more meticulous work, and thus earn good grades in classes even when they may not have as great a depth of understanding of some topics as do the boys."

Is this really true? Or are the girls *perceived* as being neater and more meticulous, with less depth of understanding? I remember with horror several experiences in graduate school in which I was, essentially, accused of doing well only because of feminine neatness and industriousness. If you've ever seen my handwriting, or knew how I spent my time back then, you'll know how ridiculous this charge was. The worst case was when I was one of two students to do an extra credit problem, and was informed that I was only able to do it because I'd used the hint in the book (I hadn't) whereas the male student had better understanding because he thought up his own proof (he used the hint).

Let's be careful, folks. Certainly women students are generally perceived as being neat, industrious, and with shallow understanding. Most probably they are socialized to appear that way. But *are* they that way? A memory of one year at a co-educational undergraduate college was how the tongue-tied women in my classes suddenly became articulate back at the dorm where the boys couldn't hear them. Apparently things haven't changed that much.

I have seen enough counterexamples to the prevalent cliché to wonder whether the problem is the students' reality, or the teachers' perceptions. Even the most well-meaning of us is subject to internalizing our society's stereotyping. Until there's a good objective test of depth of understanding, I will wonder exactly what the studies quoted are studying.

Sincerely, Judy Roitman, University of Kansas

CHAOS AND FRACTALS: AMS SHORT COURSE

Linda Keen of Lehman College, CUNY, together with Robert L. Devaney of Boston University, is directing a two-day short course entitled "Chaos and Fractals: The Mathematics behind the Computer Graphics" to be held in conjunction with the AMS Centennial Meeting in Providence. Speakers include the organizers, Philip J. Holmes (Cornell U.), James A. Yorke (U. of Maryland), Bodil Branner (Technical U. of Denmark), Virginia Harrison (U. of Calif., Berkeley), and Michael F. Barnsley (Georgia Inst. of Tech.). There will be an evening session of films and computer graphics. For more information on this fascinating course, see the April AMS *Notices*.

IS THE CLIMATE FOR WOMEN IN MATHEMATICS CHANGING?

panel discussion, Atlanta, Joint Mathematics Meetings, January 6, 1988
panelists: Louise Hay, Mary Ellen Rudin, Nancy Stanton, Karen Uhlenbeck
moderator: Judith Roitman

Judith Roitman, University of Kansas: Moderator's introduction

Let me begin by welcoming our audience to this AWM panel entitled "Is the climate for women in mathematics changing?". It is an honor to moderate such a truly distinguished panel of mathematicians.

Before introducing the speakers, I would like to provide some background on the subject. I've distributed three sheets of paper containing data about the participation of women in mathematics. The data is all gleaned from the AMS *Notices*. The first page is about employment of women with math Ph.D.'s, the second is about new math Ph.D.'s, and the third is about invited participation at large AMS/MAA meetings. I cheerfully admit to being elitist in my choice of what data to track. This is for two reasons. The first is that I am a great believer in the trickle-down theory of sociological perception — the more women there are at the top, the more open the field becomes at all levels. The second is that, for me, a major issue has been the underachievement of women, which is a corollary of our under-recognition. We do not exist in a vacuum, and there are few of us who can persevere when the messages around us are telling us that we shouldn't bother to try. Women's achievement in mathematics has been too often accompanied by heroic feats of character. Think of Julia Robinson, unsalaried, sharing a corner of her husband's office for so many years, and consider the strength of mind and will that kept her focused on her work, and unconcerned about her career. One question this panel may choose to deal with is whether, on a less obvious level, similar impediments to women's belief in their abilities still exist.

Let's look briefly at the data.

EMPLOYMENT OF WOMEN WITH DOCTORATES AT FOUR-YEAR INSTITUTIONS						
		Inst./Lect.	Asst. Prof.	Assoc. Prof.	Prof.	Total
1976-77	%	12	10	6	4	6
	#	25	234	161	125	545
1981-82	%	20	13	7	4	7
	#	39	269	205	149	662
1986-87	%	24	18	10	5	10
	#	67	369	266	242	944
(% 86-87)/(% 76-77)		2.0	1.8	1.7	1.25	1.7
(# 86-87)/(# 76-77)		2.68	1.6	1.6	1.9	1.7
AT GROUP I INSTITUTIONS						
1976-77	%	4	10	5	2	4
	#	2	16	9	9	36
1981-82	%	19	13	8	2	5
	#	7	19	11	12	49
1986-87	%	14	8	7	3	5
	#	15	20	16	26	77
(% 86-87)/(% 76-77)		3.5	.8	1.4	1.5	1.3
(# 86-87)/(# 76-77)		7.5	1.25	1.8	2.9	2.1

NEW DOCTORATES WHO ARE WOMEN			
	76-77	81-82	86-87
%	13	13	17
#	118	107	135

1986-87 EMPLOYMENT OF NEW WOMEN DOCTORATES			
	Groups I-III	Other academic	GBI
%	20	54	26
#	18	49	24

Code: GBI = government, business, industry

NEW DOCTORATES WHO ARE U.S CITIZENS					
(includes computer science)			(does not include computer science)		
year	% women	# women	year	% women	# women
72-73	10	78	81-82	17	88
73-74	9	59	82-83	20	89
74-75	11	83	83-84	20	87
75-76	12	86	84-85	20	81
76-77	13	87	85-86	21	87
77-78	14	89	86-87	20	73
78-79	16	93			
79-80	15	87			
80-81	18	102			

Note: in 1972-73 the total number of U.S. citizens receiving doctorates from U.S. universities was 774. In 1986-87 it was 362, less than half the 72-73 total. Thus the doubling of the percentage of women is due to the number of women remaining roughly constant, while the number of men declined drastically.

WOMEN SPEAKERS AT LARGE AMS/MAA MEETINGS						
	Jan. 77	Aug. 77	Jan. 82	Aug. 82	Jan. 87	Aug. 87
short course	1					
AMS invited address				1	1	1
MAA invited address	1	1	4	2	1	
AMS/MAA panelists	7	4	3	2	8	7

Note: the number of women panelists swells in the years when math education or women are panel topics.

Not wanting to take too much time away from the panelists, I will summarize quickly. In four-year academic employment we've gained some stability — from the fragile situation of 545 women in 1976-77 (out of more than 8,000 men) to the 1986-87 figure of 944 women. Also note that in 1986-87, below the rank of full professor the percentage of women employed bears some resemblance to the overall percentage of Ph.D. production, which has been fairly steady in the last ten years.

But these are the only gains. In group I schools the situation remains extremely fragile — 26 full professors in 1986-87 is better than the nine of 1976-77, but 26 is still a very small number. Note also that since 1972-73 the raw number of U.S. citizen women math Ph.D.'s has been fairly constant, generally hovering in the mid to upper eighties, and that it took 149 institutions, many with more than one department in the mathematical sciences, to produce the 135 women Ph.D.'s in the 1986-87 chart.

It is striking that nearly one-third of the new women math Ph.D.'s in 1986-87 were employed by government, business, or industry.

Now I'd like to mention some of the questions and issues that I hope will be addressed by our panel. The first is whether institutional acceptance has changed. Clear gains have been made in governance — from women department heads to women presidents of MAA and AMS. What about honors granted by the community?

Have attitudes towards women changed, or have they merely gone underground? The days when it was openly said to women by male mathematicians that mathematics is inherently masculine are nearly gone (although the popular media have not gotten that particular message). But does the attitude persist? Are women subtly discouraged? ignored? treated condescendingly? My greatest concern here is for young women — graduate students and new Ph.D.'s — who are so very vulnerable in their professional self-image.

Anecdotal evidence culled in the last three hours at this meeting indicates that women are still being ignored, overlooked, and treated downright rudely. Typically an anecdote involves a woman in a group of men finding that no comments are addressed to her, and that her own contributions are ignored or co-opted — this includes women with well-regarded careers in the mathematical community. To quote Anne Leggett, "Things are clearly better, but there are still a whole lot of jerks out there."

What about personal choices — balancing work and family life, mobility, whether husbands and significant others are generally doing a better job in supporting our work needs than they used to, whether institutions are more sensitive to our children's needs and the necessity of meeting them?

A more subtle issue is the range of acceptable behavior for women in the context of the mathematical community. Our expressions of emotion, sexuality, power; our linguistic habits, of deference, of aggressiveness; our bearing, whether cute or motherly or dignified — the details of our behavior determine to a greater extent than our community cares to admit whether we are accepted by that community, encouraged, tolerated, or cast out. From the junior high school girl on the math team to the named professor, there are almost invisible rules of social behavior we must follow, rules which have traditionally come from a particular intellectual subculture dominated by white males. These rules influence not only which women survive, but, perhaps even more crucially, which young women choose to enter the profession. Have the parameters broadened? Are the rules changing?

Finally, and strongly related to this last issue, is the institutionalizing of gender. In what ways, if any, is the predominantly male image of mathematics being attenuated? Is there anything that we, as practicing women mathematicians, can do to speed this process along?

The institutionalizing of gender is the crucial issue that subsumes all others. Some of you may know that I began life as an English major, never dreaming that the tremendous pleasure I got in junior high from the identification of algebra with geometry, or from the proof that the reals were uncountable, could have anything to do with my own life. If mathematics were not institutionalized as masculine, this panel would not exist, young women would flock into the field, and our position would not be as fragile as it is. There are those who would have us believe that women lack the genetic equipment to do mathematics, but this room is filled with counterexamples. Four of the most distinguished counterexamples are members of this panel, and it is my pleasure now to introduce them.

Mary Ellen Rudin, University of Wisconsin

I thought it was appropriate for me to speak from an historical perspective, being the right age for this.

At the turn of the century, women had troubles being accepted as students. They couldn't get into the universities. There were a lot of women interested in mathematics, but they had great troubles being accepted even as students in universities to study mathematics.

By 1920 they were pretty routinely accepted as students in most of the research institutions. They got Ph.D.'s, but most of them did very little research. They mostly went into positions in education or as administrators at women's colleges. It should be mentioned that there were really very few male mathematicians in the United States doing research at that time. We were not a great center for research mathematics during the 1920's. That's hard for us to remember now.

The 1930's saw the introduction of nepotism rules. They sound very weird to us now, but the truth is that in the 1930's jobs were terribly scarce. People were hungry. The idea that there should be two people in a family who got a salary from a standard institution was really viewed as immoral. And this was the basis on which nepotism rules were started. The problem was that once they were settled in people's minds, they were hard to remove.

By 1950, America was a major mathematical power. The women mathematicians were totally accepted intellectually by their male counterparts. However, I call this groups of women the "housewives generation." This is my generation. Most of us had lots of children. Very few of us held professorships at standard research institutions. We were amateur mathematicians, very enthusiastic and very well-trained for the most part. We were accepted as students and as mathematicians in the community, but job opportunities — opportunities to be a professional — still didn't really exist.

By 1970, consciousnesses had been raised. Women demanded and were given professional positions. They were welcomed into graduate school. Universities went looking for the appropriate woman mathematician to be on their staff. Women were still sometimes discriminated against because universities were anxious about these women mathematicians. They weren't quite sure. Women had more problems with family and such things than the men did. So even though the universities were looking for women, they didn't always accept them when they found them.

Also, the women themselves dropped out very often. They didn't choose to follow through on the process — and it is a difficult process. Another problem that we see now is that we are a rather inconspicuous minority that exists throughout the community, and they often forget that we are here. When you are deciding who should give a lecture in something, you think about the men that are there, and you don't always think about the women that are there.

Let me give my own history just a little bit. When I went to the University of Wisconsin with my husband, who got a full professorship there in 1959, I was enthusiastically accepted and encouraged to come and join the mathematical community. I was given a lectureship, a position that was temporary and part time. I could do things when I wanted to. I was paid essentially nothing. It never occurred to me that perhaps that was not the right position for me to have. Nor did it occur to the university that that was not the right position for me to have.

In 1970, they made me a full professor instantaneously, without going through any of the usual procedures.

Today, in addition to me, there is Georgia Benkart, an algebraist of the first order, a really fantastic mathematician who is recognized all over the country as one of the leading algebraists. Debby Joseph, in complexity theory, is there. She is a very strong research mathematician, does a great deal of research, and is very well known in her field. There's Carol Bezuidenhout, who is a probabilist — a young woman who is very capable and doing fine research. Vera Pless spent the year with us. We have strong women in statistics and education also.

We have a very strong group. We are totally accepted by everyone as equal, which we are. We are accepted on every possible level — that is, on the social level, the intellectual level, the running-the-show level, whatever level you want to have. We're five out of ninety, so the proportions are not dramatic. But it is significant that maybe a third of the people who have been hired by the University of Wisconsin in the last fifteen years have been women. Things are changing a little bit.

Almost a fourth of the graduate students are women. Their drop-out rate is much higher than it is for the men, before they get a Ph.D. and after they get a Ph.D. The number of them who eventually end up really doing research mathematics is not what I would like to see it be.

I should mention while I am bragging on the University of Wisconsin that we still have lecturers of the kind that I was once. Three women and one man teach some courses for us for no money because they are in town and we can get them to do it. None of them does any research. But they are willing to be exploited. It is perhaps interesting that there are five out of ninety who are really part of the community and three out of four who are lecturers.

Louise Hay, University of Illinois, Chicago

Fortunately, Mary Ellen did a sufficiently thorough job that I can just fill in a few things. When I was told that the subject of the panel was whether the climate has changed for women in mathematics, I thought about it, and it seems to me that the answer is a resounding "yes and no."

In the area of hiring, I have seen in my own institution, which I joined in 1968, the replacement of what was very much an old-boy network — in which it was the kiss of death to apply for a job rather than have your thesis advisor call the department head to recommend you — by a system in which applications are invited, encouraged, and actively looked at. Some of our best recent hires have been people who came to our attention because they applied in response to an ad. I am aware that this doesn't happen everywhere, but there are certainly places, including my own institution, where it's taken very seriously.

In the area of institutional acceptance, there certainly has been a change. I became head of my department in 1980. I suspect in 1970 that would have been almost inconceivable, but in 1980 it caused very little stir. I think attitudes have changed, although not always as rapidly as we would like. I have had people in my department compliment me on something that I have accomplished for the department by saying, "You're really the right man for the job." I appreciate the sentiment, but not the language.

I think in the area of personal choices there has been a real improvement. To tell you a little bit of my own history here — I am slightly younger than Mary Ellen, so I came at a slightly different stage in the evolution of the process — I dropped out of graduate school when my husband finished his degree in order to follow him to his first job, as everyone did in those days. I taught for a few years. When I became pregnant with first child I resigned from my job, as everyone did in those days. And it was my good fortune that the climate was just changing. The *Feminine Mystique* came out, I read it, and I went back to graduate school. Parenthetically, this turned out to be a very good idea, since I got my degree a couple of years later, and three years after that I was divorced with three small children, and life would have been a whole lot different if I had not had my Ph.D.

I don't think it is considered essential any more for women to follow their husbands around. There are many counterexamples: there are people who manage a marriage in two different cities, there are men who follow their wives to their positions. I think men are more helpful around the house. I am finding in my department that the young fathers take their childcare obligations very seriously. They schedule their teaching and their seminars around going home to help take care of the children — and they no longer refer to it as "babysitting." Women never did: it was only men who had to go home to babysit, women took care of their children. They no longer are different that way, which I think is an improvement.

I think things really are better for the women who are at the top of their fields. When the chairman of a major department approaches me and says, "We would really like to hire a woman logician. Can you tell me who are the top women in logic?", I think he means it.

Unfortunately, not everyone is at the top. To paraphrase Virginia Woolf in her essay "A Room of One's Own," — and I do not remember her exact wording — women will not achieve equality until they have earned the right to be hacks. Men can be hacks and be accepted on that basis. Not everyone is a genius. In fact, Virginia Woolf says (she was talking about literature and art) that it requires a certain critical mass of average people to produce geniuses. And this is what I think women have not yet achieved: the critical mass, and the acceptance at the average level, even though women at the top have to a large extent achieved acceptance.

The greater problem is simply the fact that there are so few women going into mathematics. I think the problem is no longer what happens in graduate school, or even what happens in college. The question is, why aren't more women taking mathematics in high school? Why are they getting discouraged at an earlier stage? It is a critical problem, not just for women but for the mathematical community as a whole. White males are no longer going into mathematics — at least not if they are American citizens — and if there is going to be a next generation of mathematicians we have to get more women into the field, we have to get more minorities into the field. I wish I had some ideas about how we can best do that, but I think some smart people had better start thinking about solutions.

Karen Uhlenbeck, University of Texas

I am somewhat younger than Professors Rudin and Hay. I went to high school in the 50's, entered the University of Michigan in 1960 and started graduate school in 1964. I would say the women's movement and the controversy and changes it made did not reach me personally until the period I taught as a lecturer in Berkeley from 1969-1971. Then they hit with a vengeance.

There is no doubt that great changes have occurred. When I applied to graduate school, Princeton University did not accept women at all as students in mathematics, let alone as teachers. When I looked for my first three jobs, nepotism rules not only existed, but were enforced even when they didn't exist. The things which were said to women students and young women Ph.D.'s were incredible. They never should have been said, and I find them too horrifying to repeat. I hope much of this has fundamentally changed, although I myself continue to experience a sense of *déjà vu* in most discussions of hiring minorities in the scientific community.

Also, my remembrance of the sixties and seventies is quite different from the way the mathematics establishment tells it. This makes me furious.

I myself cannot speak to the questions asked by Professor Roitman, because I could never consciously cope with that sort of awareness. I do not believe I would be where I am today if I had allowed myself to notice the social situation. I have however been forced to become somewhat aware of the layers of unconscious defensiveness built up to (successfully) handle the situation. Attempts to rationally decipher the outlook for women, or myself, generally end in depression. I well remember that at about 1970, upon noting from a study of women at Berkeley that with each decade the mathematics department had one less woman professor of mathematics with tenure, I became somehow convinced I would be the minus first of the next decade. By 1969, there were no tenured women on the mathematics faculty at U.C. Berkeley, and this seemed the only logical conclusion. I suppose that in honesty this title belongs to Julia Robinson.

Happily, this in the end was not correct. The late 60's may have represented a period of minimal representation of women. Julia Robinson became professor before her death, and there is indeed now one tenured woman at Berkeley in the mathematics department. An optimist might hope for two in the next decade. Things have surely improved, at least in some universities.

However, the improvement is not uniform. There are many large mathematics departments with no women members and many women students. There are some places in the mathematics community in which I feel comfortable and at home and others (across the street so to speak) in which I feel isolated and unwanted. It is not so rare for me to be the only woman in a room full of mathematicians and to suddenly get a feeling of alienation I luckily never experienced as a student. On the other hand, I was spoiled during my years at the University of Illinois at Chicago. I enjoyed gossiping with senior professors in the ladies room. Both experiences are common.

It remains true that the world of mathematics is a male world which is primarily Caucasian. It is really not possible to be a successful mathematician without accepting this fact and feeling at least somewhat comfortable in this world. I wish I knew the secret of the success of Orientals in this world. This fact provides a barrier between successful women scientists and the official feminist line. I have had considerable difficulty in coming to any conclusion on this issue. It is not an intellectually tenable position to argue against the essential "masculinity" of the world of mathematics and the question of sociological causes and effects in general. However, few women mathematicians regard the idea of "feminist mathematics" with anything but horror. I believe the resolution of this difficulty is to hope that it is the goal of good ideas in mathematics, like the best of all human thought, to rise above concepts such as masculine, feminine, 20th century, American and so forth. Due to human limitations, this is impossible. However, the deliberate attempt to pull down beautiful abstract ideas into the world of a battle between the sexes does seem sacrilegious to me. Nobody gains by destruction, no matter if things aren't right as they are.

One point worries me. When I started my career, women weren't supposed to be mathematicians. In these circumstances, my ambitions or at least my expectations were very limited. Anything I did represented success. Now I hear from all sides that there is equality and women have no trouble. Not so. Women are not accepted everywhere. Life is hard for us for a number of reasons. I literally cannot think of a woman mathematician for whom life has been easy. Heroic efforts tend to be the norm. There were some advantages to fewer expectations. I find myself with fears for my younger colleagues that I never dared have for myself.

I would like to end with praise for a few measures which have been helpful. Even in the days when women weren't supposed to be mathematicians, I was awarded an NSF graduate fellowship. In my unofficial counts of women in geometric analysis with NSF grants, I have found consistently better than 6%.* This is a world in which barely 3% of tenured faculty in the top 35 mathematics departments are female, and we believe the figure is much lower in the top 10! The AMS committees and hour speakers at meetings faithfully have good representation. Unfortunately, other meetings (even those under AMS and NSF auspices) rarely bother, as you may have heard about the International Congress or can see by looking at the speaker list for the recent Symposium in honor of Hermann Weyl or the AAAS meeting in Boston in February. The NSF graduate fellowships and the NSF Visiting Professorships for Women have been very good for us, I think. Equal opportunity and minority programs do not foster revolutions, but they really do help individuals win against a stacked deck.

*I was wrong in Atlanta when I said 10%.

Nancy K. Stanton, University of Notre Dame

I am the youngest member of the panel, and I was in graduate school when the AWM was founded. As a result of efforts primarily by the AWM, I think there had already been a large change in the climate for women in mathematics very early in my career — changes which resulted, for example, in women being elected to the AMS council, women hour speakers at regional and national AMS meetings, more women on the faculty in major research departments. As a result, I am not sure that I have much perspective on whether the climate is changing. I will confine my remarks to some problems facing women in mathematics today.

Women need to be encouraged more to apply for fellowships. One of the committees I am on is the AMS fellowship committee. Last year we had only one woman applicant, and this year we have none. The percentage of women applying for the NSF postdoctoral fellowships has been below the percentage of women among U.S. citizens receiving degrees while I have been on the committee. There have not been many nominations of women for Sloan fellowships for the last couple of years. All of this indicates to me that we are not encouraging good young women enough. I understand that there have not been many applications for NSF Visiting Professorships for Women from mathematicians for the last couple of years. A number of the mathematicians who have had such awards have found that the year spent visiting another institution enabled them to establish valuable, continuing contact with mathematicians at the host institution — contact they would not have established without the award.

I think the problem of mobility is a very major problem. Many married women are not free to move, or even to go on leave and visit an institution in another city because of their husbands' jobs. Last year I had an NSF Visiting Professorship for Women, or VPW. In May most of the women who held VPW awards last year attended a meeting at NSF. One of the major topics which came up was the problem of mobility. Of course, more and more men are finding that they have decreased mobility because of their wives' jobs.

Because the number of Ph.D.'s in mathematics and the number of U.S. citizens receiving Ph.D.'s in mathematics have dropped so dramatically, many mathematics departments have had increasing difficulty during the last few years in hiring, or at least in hiring mathematicians as good as the ones they were able to hire a decade ago. As a result, no department can afford to ignore women mathematicians. In fact, since the percentage of Ph.D.'s who are women is still quite low, one possible way to deal with the shortage of mathematicians is to encourage more women to go into mathematics.

One problem I have run into as a woman mathematician is that I am asked to do far more for the mathematical community than a man with a comparable position is. Last year, for example, I was on three AMS committees and I was an AMS representative on the NSF postdoc selection panel. I have also been asked to referee excessive numbers of NSF proposals, in part, I think, because there is pressure to use women as referees. A number of other women mathematicians I know have run into similar excessive demands on their time. This certainly shows the success of the AWM in pushing, for example, for women to be adequately represented on AMS committees. However, it also tends to create an unfair burden for some of us.

I sometimes encounter the view that there is exactly one good woman mathematician in the country — Karen. For example, sometimes when I have asked a mathematician why there are no women in his department, the answer is "We talked to Karen a few years ago, but she wasn't interested."

Although I think it is increasingly rare, I know of some recent cases of departments or administrations trying to take advantage of women, acting under the assumption that a woman cannot move because of her husband's job. Such attitudes must be fought. For example, I know of one woman mathematician who is paid a lower salary than most of the other full professors in her college. When she found this out, she went to her chairman to ask why and was told that her husband has a good job and her husband and daughter are healthy, so she should be happy. She has recently accepted a much better position in another institution.

I encounter the attitude that "women can't do math" at my own institution, Notre Dame — not among my colleagues, but in the administration. In particular, freshman women are often steered by their advisors into math courses below the level they should be in — either courses which do not give students the prerequisites for serious science, engineering and math courses or a version of calculus which begins with some algebra and trig, and so takes three semesters to cover what the standard science and engineering calculus course covers in two. Whenever we question the dean of freshmen about this, he has some explanation to prove that the student was placed properly. However, my colleagues and I have found few white males who aren't athletes being placed in courses below the level where they should be.

NEW EDITION OF THE SPEAKERS' BUREAU DIRECTORY UNDERWAY

The Speakers' Bureau is one of AWM's most important ways to reach out to young women in high school and college. We are therefore preparing an updated edition of the Speakers' Bureau Directory, which will hopefully be available at the start of the academic year in September.

Please join the Speakers' Bureau! We need as broad a participation as possible so that schools can select a speaker who most closely fits their needs and interests.

You should already have received information about the Speakers' Bureau and a registration form in the mail. You may also join by filling out the form on the next page (or a facsimile). Lori Kenschaft, in the AWM office, can answer any additional questions you may have.

Thank you! Your participation will make this the best Directory yet.

AWM SPEAKERS' BUREAU REGISTRATION

Name: Address:

Office phone:
Home phone:
(Please indicate which numbers are okay to list.)

Position: Degrees:

Field:

Other qualifications and interest:

Possible topics for talks, with suggested audience levels:

Codes:				
Gr	Graduate school/colloquium	C	College (L- lower division, U - upper division)
HS	High School	JHS	Junior High School
E	Elementary School	Ed	Educators & Education majors
Gen	General Audience (PTA, etc.)	F	Flexible (tailored to audience)

BOOK REVIEW COLUMN

by Martha K. Smith, University of Texas at Austin, Book Review Editor

Bridges to Infinity: The Human Side of Mathematics, by Michael Guillen. Jeremy P. Tarcher, Inc., Los Angeles (distributed by Houghton Mifflin, Boston), 1983, 204 pp., $6.95 paperback. ISBN 0-87477-345-8.

Fearful Symmetry: The Search for Beauty in Modern Physics, by A. Zee. Macmillan, New York, 1986. xiv + 322 pages, $22.50. ISBN 0-02-633430-5.

There is little doubt that the nature of mathematics and science is not well understood by the general public, and probably less so by the average (even well-educated) woman than by the average man. Consequently, I think it behooves us to look occasionally at books which aim to present mathematics and science to the general public, in order to see what is being done in this area, to evaluate whether the approach is apt to speak to women, and to gain ideas to help us communicate better the nature of our subject. Putting my money where my mouth is, I selected two such books to report on here. Guillen's book came to my attention through a book catalogue entitled *The Common Reader*. There, amidst books on art and literature, was a math book, described in glowing terms. Wow! Zee's book caught my eye in a new book display in my library.

Guillen begins by asserting that math anxiety is the result of misconceptions about mathematics. One of them, he claims, is held by many mathematicians as well as nonmathematicians: that mathematics cannot be expressed in ordinary language. He has written this book to help dispel that myth. The bulk of the book consists of short essays (with catchy titles) on various mathematical ideas. My favorites were "Locating the Vanishing Point: Limits and Calculus" (perfection and vanishing points illustrate the concept of limit), "Irrational Thinking: Continuity and Numbers," "Singular Ideas: Natural Infinities" (black holes and electrons illustrate infinities that are physically bounded), "A Stretch of the Imagination: Topology," and "The Familiar Faces of Change: Catastrophe Theory."

The more I read, the more impressed I became with Guillen's ability to convey the flavor of mathematics without going into details. His style at times reminded me of Isaac Asimov's science essays. As indicated by the examples above, he uses metaphors and models to give an intuitive explanation of sophisticated topics. True to his subtitle, he often discusses the "human" (to the layperson; to me, mathematics is inherently human — after all, it's done by humans!) side of mathematics. He runs the gamut from quoting Bertrand Russell's disillusionment on discovering his paradox, to using chess to illustrate the limits of our reasoning powers, to speculating (intriguingly, I find) that the applicability of mathematics pursued for its own sake is a consequence of the human imagination's being a kind of sixth sense.

I think the book is accessible to a reasonably well-educated reader who is willing to do a little thinking. I'd recommend it to bright high school students with even a slight inclination toward math or science, to colleagues in nonscience fields, to high school math teachers, and to undergraduate math majors. Most of the essays seem too demanding for the average student in a math-for-liberal-arts course at an average university, but teachers of such courses could get some good ideas from the book. In fact, I strongly recommend it to anyone trying to communicate math to the layperson. It is not the final word on the subject (for example, I'd like to see more use of nonsexist language), but is a significant contribution.

Zee describes his book as an account of "the aesthetic motivations that animate twentieth-century physics." The exposition is broken up into short sections, making the book easy to read a bit at a time. Zee does succeed in conveying both the excitement and sense of wonder surrounding modern physics. He discusses (in an intuitive fashion) a fair amount of mathematics along the way. His flair for colorful metaphors (e.g., "Recall the ghostly insouciance of the neutrino, and contrast that with the gregariousness of the photon, who hobnobs with anyone who is charged," p. 219) makes for enjoyable reading. The book is certainly an easy way for a mathematician with little knowledge of modern physics to learn a bit about the field. It would probably be accessible to much the same category of well-educated-and-willing-to-think-a-little reader as Guillen's book.

The author clearly attempts a nonsexist style. I found his casual references to a hypothetical architect, mathematician, or architect as "she" endearing. He gives good accounts of both Emmy Noether and Madame Wu. (In fact, Chapter 8 could stand alone as an essay on Emmy Noether and her contribution to physics.) However, his personification of Nature as She and the Grand Designer or Creator as He turned me off — especially when, in discussing Hideki Yukawa's prediction of the pion, he wrote, "There is immense satisfaction in being arrogant with Nature and then in seeing Her oblige" (p. 166). (One additional note of warning: especially toward the end, Zee often adopts a religious tone which is apt to offend both the nonreligious and the very traditionally religious.)

Despite my quibbles, I am glad to see both these books exist. They make me suspect that the problem may not be so much the lack of willing and able expositors as getting the attention of the intended audience. We need to get writing like this off of library shelves and into adult education programs, book discussion clubs, courses for high school teachers, gift lists, and popular magazines.

FATE OR FICTION?

"Fate or Fiction: Biological Theories of Human Behavior." A 30-minute slide-tape presentation, with study guide. Sociobiology Study Group of Science for the People, c/o Jon Beckwith, Harvard Medical School, Boston, MA 02115, 1987. Sale: $150. Rental (up to 2 days): $35.

Pansy Brunson (Director, Math and Science Center, Western Kentucky University, Bowling Green, KY 42101) and her colleague Doreen Geddes (Communication and Theater) reviewed "Fate or Fiction?" for the AWM Education Committee. Here are their comments.

This slide presentation with accompanying narrative and study guide traces the development of biological determinism and its effects on social issues. It focuses on the misuses of biological determinism research as it explores the nature–nurture controversy from ancient Greece through the 1960's. Specific controversies examined are: (1) the 19th-century justification for superior social status of whites based on average brain size; (2) the 20th-century eugenics movement that resulted in repressive laws; (3) the claims that differences in IQ scores between blacks and whites are caused by biological differences; and (4) the recent biological explanations for differences in math test scores between boys and girls.

Of particular interest for us is the section which deals with Benbow and Stanley's research comparing the math ability of boys and girls. Not one piece of research is mentioned in the narrative which counters their findings, such as research done by Fennema, Lockheed, Fox, and Sherman. The study guide, however, does give a good synopsis of the Fennema and Fox research on this controversial topic. The study guide also hints at Lockheed's research in one of the questions for discussion, without mentioning her name. The first two questions suggested are good ones for discussion of sex-difference issues, and the ideas for projects address this topic quite adequately.

The study guide is a useful resource. In addition to discussion questions and project ideas, there is a brief but good overview of biological determinism, a vocabulary section, and a bibliography. For the topic entitled "Sex Differences in Math Ability," the bibliography is too limited and emphasizes support of biological determinism. The only entry critical of this theory is an article "Girls, Boys, and Math" from *Biology as Destiny: Social Fact or Social Bias?* by Beckwith and Durkin. Surprisingly, neither Fennema nor Fox were included in this list even though their research was discussed in the study guide. Such a lengthy segment on sex differences certainly deserves a more thorough review of the literature. It is also unfortunate that the author is not familiar with Lockheed's research. A 1985 report, written by Lockheed with four other authors, entitled *Sex and Ethnic Differences in Middle School Mathematics, Science and Computer Science: What Do We Know?* was favorably reviewed in *The Mathematics Teacher* (November, 1987) and contains an extensive bibliography. Lockheed *et al.* discuss the biological factor as it relates to sex differences in math in two separate parts of their report. This information would be a valuable addition to the section on mathematics in the narrative of the slide show and should be listed in the "*Con*" category of the "Sex Differences in Math Ability" section of the bibliography.

Overall, we do not recommend the use of this slide show. It is not well-organized, and although the basic content is commendable, the poor narrative seriously detracts from the presentation of current and controversial topics. Although the study guide is informative and helpful with questions for discussions and ideas for projects, it will not be utilized unless teachers take the hours necessary to read it. The bibliography has serious omissions in the topic "Sex Differences in Math Ability," which leads to concern about similar neglect in other areas.

A REPORT ON WOMEN IN CHINA, 1987

by Susan Gordan Marchand, Lily E. Christ, Alice T. Schafer, and Evelyn M. Silvia

As members of a 1987 Undergraduate Mathematics Education Delegation, we visited the People's Republic of China from August 26 to September 10. The delegation leader was Warren Page, and the professional exchange was conducted under the auspices of the Citizen's Ambassador Program of People to People, International.* Our purpose was to exchange information with our Chinese counterparts concerning current practices in mathematics (and computer) education.

We went to Beijing, Nanjing, Wuhan and Shanghai — visiting 12 universities and normal universities, two mathematics societies, a machine tool factory, and several middle schools (including one in a township (commune)). Our exchanges involved some combination of informal large group interaction, small group discussions, and more formal presentations focused around previously agreed-upon topics. The visits to universities were attended by professors from the university being visited and from other universities in the area, by graduate and undergraduate students, and by factory school and high school teachers.

During our trip to China, the authors were especially interested in the issue of women and mathematics. We realize that our visit was very short and that a longer experience may have led us to very different perceptions. There are even some contradictions in the information that we obtained. Sometimes we got quite different answers to the same questions asked of different people. It is possible that when we spoke with different people, they opened up in different ways. Also, while the Chinese were very open in discussion, they were certainly not homogeneous in their expression of ideas. What follows is by no means a total picture. Rather, it is the collective understanding of the situation as we saw it during our visit.

* The other members of the delegation were H. Anton, L. Beineke, I. Bivens, G. Britton, G. Bryce, P. Campbell, P. Cheifetz, L. Lange, R. Lesh, J. Longyear, J. Sandefur, and R. Scheaffer.

First, we present some background information concerning the schools and education requirements. Children begin school at the age of six to seven years, with the primary stage lasting six years. Secondary school is divided into two parts — junior middle and senior middle — each lasting three years. At present, the first six years of school are obligatory, but the level of education attained varies considerably throughout the country. After 1990, the first nine years of education will be obligatory, and there will be three years of senior middle school available to students who qualify for it. Some schools in each province are designated as *key* schools, and the more talented students attend them. In the classes that we observed, the sexes were evenly distributed.

Students study mathematics six days per week, for 40 minutes per session, 19 weeks per semester. Thus, the Chinese students have 228 days of school each academic year compared to the usual 180 days required for many students in the United States. Course content is determined by a national syllabus. Coverage of the material specified is mandatory, while teachers may add material. There are "interest groups" that meet after school which enable the students to study extra topics. Students are about ten years old when they first get mathematics teachers who are specialists.

Topic coverage is spread out over at least six years. For example, their Algebra curriculum includes slightly more than is normally covered in our Algebra I and Algebra II. However, their exposure to the subject is spiraled over a six-year period.

For the most part, students make their major career decisions concerning continuing education while they are in senior middle school. In the last two years, students are divided into groups because their preparation becomes more specialized. The national university entrance examinations are different, depending on the proposed major. There are seven subjects included on the examination that the science students take: Mathematics, Physics, English, Chemistry, Biology, Geography, and Chinese.

In order to continue their education at the university level, students must score well enough on the national examination. The total score possible is 700 points. Last year, a total of 420 was the lowest score one could have in order to qualify for entrance into a college or university. The base score changes from year to year because there is a set number of slots — determined by the number of places available for the students to live at the various universities. The lowest passing score in each subject is 60. Each university sets its own minimum score for entrance. For example, the minimum score for acceptance into Wuhan University is 650. In addition, students list four schools in chosen categories, such as university, normal university, etc., when they take the examination. We were told that students need to be clever about their choices. One student told us that if a university was not listed as the first choice, the university might not select the student for acceptance even if the score qualified. Thus, it is important for students to choose universities carefully. With rare exceptions, the examinations determine possible avenues for further education. Students rarely take the examination more than two times. If a student's total score is below the minimum required for acceptance anywhere, then the student can either take a job or go to a three-year college. These three-year colleges, to which students commute, are more expensive to attend. They prepare the student for jobs that will pay less than those available to the graduates from the universities.

Students applying to a university must specify a major. In addition to minimum overall scores on the national exams, the universities also set minimum scores for specific areas. Once in a program, a student rarely switches to another. For example, students do not normally change majors. Lack of success in the chosen major usually leads to the student taking a job other than what had been intended.

All the students in the sciences take one and a half years of calculus and half a year of linear algebra. The mathematics majors take a heavy additional load, primarily of mathematics, in the first two years. This includes at least the coursework that mathematics majors in the United States would complete in the first three years of college. More specialized training such as projects and particular courses come in the last two years.

There are opportunities for educational advancement by means other than in the traditional university setting. For example, there are factory schools and institutes associated with particular fields such as electrical work, machine design, etc. In addition, there is a TV University from which students can obtain credits. Of course, anyone can watch and learn. The programs are on TV throughout the day. The ones that we saw were well done with excellent illustrations. Finally, there is an education system through correspondence.

In China, girls are neither overtly encouraged nor discouraged to study mathematics. However, the girls said that there are many subtle "messages" that discourage them from pursuing mathematics. They added that, in general, parents are more interested in their sons' careers. Some girls expressed that they "don't have as much ability as boys." At Nanjing Normal, we asked, "Is there a bias that girls can't do mathematics?" The men said "No," while the women said "Yes."

Concerning student ratios, we were told that half the students at Wuhan's #1 Middle School, associated with Huazhong Normal University, were girls. The scores their students earn on the mathematics part of the national examination are among the best in China. The overall average grade, taken over all students from this school, on last year's national examination was 91%. There is also a national middle school mathematics competition analogous to those sponsored by the MAA in the United States. Half of those who compete in their national mathematics competition are girls. At the same school, we observed some interest groups that meet after school. In radio repair, there were 6 girls and 15 boys. In computer programming, there were no girls and 5 boys, though we were told some girls belong. Finally, we were told that 40% of the students in a model airplane group were girls.

At the middle school in Maqiao Township, which is a suburb of Shanghai, we visited three upper middle mathematics classes. The first year, taught by a woman, had 18 girls and 24 boys. The second and third years, taught by men, had 22 girls and 30 boys and 18 girls and 28 boys, respectively.

The situation changes at the university level. A young teacher from Shanghai Educational Institute, who had studied at East China Normal University, told us that there were 6 women out of 38 in her university class. At Beijing University, 1/8 of the undergraduate students are women, and this decreases to 1/9 at the graduate level. At Nanjing University, a reverse in the trend is evident with 10% of the undergraduate mathematics students and 30% of the graduate mathematics students being women. Also, in a second-year computer class at Wuhan University, we counted 19 women out of 93 students. At Huazhong Normal, we observed a physics class that had 13 women out of 52 students. We were told that the mathematics enrollment there consisted of 20 women and 140 men. As evidence of change, we were told that 40% of those students accepted in mathematics at East China Normal for this year are women, which is more than in previous years.

In Shanghai, it was indicated that 80% of primary mathematics teachers and about 80% of lower middle school mathematics teachers are women. The percentage is much lower for upper middle school. For example, at the Wuhan #1 Middle School, we found that the upper middle school math faculty consisted of 7 women compared to 18 men, while the computer faculty included no women and 2 men. On the other hand, half of the faculty in the entire school are women.

At each session attended, we inquired concerning the numbers of women faculty at various ranks. In China, there are two professorial ranks, Full and Associate. In addition, there is a large number of Lecturers (comparable to Assistant Professors in the U.S.) and Assistants (comparable to Teaching Assistants in the U.S.). The Normal Universities assume primary responsibility for the training of future teachers at the secondary school level. The following table is a summary of findings gathered during *informal* discussions with different individuals. It is not official in any way!

Male (M) vs. Female (F) Faculty Ratios

University/ Normal Univ.	Full Prof.		Assoc. Prof.		Lect.		Assist.	
	M	F	M	F	M	F	M	F
Peking University	(15% of the mathematics faculty are women)							
Tsing Hua University	9	1	40	9	42	18	(included in Lect.)	
Beijing Normal		0	(1/3 of Assoc. and 1/3 of all math. faculty are women)					
Beijing Inst. of Tech.			(20 out of 70 math. faculty are women)					
Nanjing Normal	13	1	10	1	40	10	27	6
Nanjing University	10	0	30	3	34	5	15	3
Wuhan University	12	0	27	3	40	10	30 (mostly women)	
Huazhong (Central China) Teachers' University	2	1	20	10	30	30	(included in Lect.)	
Huazhong Univ. of Science & Tech.	9	0	22	10	32	15	?	
East China Normal	6	0	25	7	19	10	?40?	
Jiaoton University	5	0	26	4	30	20	?	
Tonji University	(2 out of at least 22 mathematics faculty are women)							

Without exception, the large majority of those in attendance at meetings were male, not unlike professional meetings in the United States. In fact, often less than 10% of the professionals in attendance were women. There were even fewer women at our meetings with faculty from schools primarily interested in research. In general, our mention of concern about the participation of women in mathematics was openly and warmly received. At Tonji University, when Alice Schafer introduced herself and said she was interested in the participation of women, the *men* applauded. The one woman present at the time warmly took her hand and squeezed it. Sometimes there were subtle indications of different expectations. For example, at Beijing Normal University, a young women brought in a huge thermos of hot water to refill our tea. After she presented it to a male faculty member, he gave it to a woman colleague to pour.

Many of the women whom we talked with about AWM were very enthusiastic and expressed great interest in our newsletter. When we mentioned the membership fee, which is very large in comparison to their monthly salaries, they looked very disappointed. We decided to work towards making the newsletter more accessible to women in third world countries. Upon our return to the United States, the four of us and J. Longyear sent a memo to the Executive Committee of the AWM requesting consideration of the proposal that a sliding dues structure be instituted to accommodate possible members from developing countries. We are pleased to report that the Executive Committee voted to give 100 free memberships per year to women in Third World and Eastern Bloc countries. Each recipient will be asked to share her newsletters at her university.

Our visit to China was very stimulating. All of the Chinese with whom we had contact were open and friendly. Many of them asked questions about professional matters and about life in the United States. Several expressed a strong interest in visiting the United States. We received many requests for information about our graduate programs, curriculum, and texts. The professionals with whom we met were also quite willing to answer any questions. We had several interesting discussions concerning life during the cultural revolution and current matters related to the state of their professions. Several of us are corresponding with students and faculty whom we met while on our trip. We look forward to a continued dialogue with our counterparts in China.

DR. SUSAN GORDAN MARCHAND IN AIM: ROUTING TELEPHONE SERVICE

Susan Marchand, longtime member of AWM, is a role-model in videotapes which are part of an integrated learning module called "Routing Telephone Service." The module, released in November, 1987, is one of six in a series called AIM (Applications in Mathematics) that is produced by the Mathematical Association of America with funding from the National Science Foundation.

Each module consists of teacher and student workbooks, the video, and a computer diskette. The modules are expected to reach at least 10,000 high schools throughout the U.S. and are available free of charge from MAA, 1529 Eighteenth Street NW, Washington, DC 20036 (write to this address for a brochure and order form). They ask only that one copy the tape and return the original.

Marchand initiated the project while she was working at Bell Communications Research (Bellcore). It uses her work on a new toll-free dialing system developed by Bellcore for the Bell operating companies to offer to customers. "Routing" in the module refers to the location to which a customer chooses to have an 800 number (which is actually a "dummy" number) sent. This choice may depend upon varying conditions such as day, time, and staffing concerns.

Bellcore acted as the "cooperating industry" and provided both time and materials to complete the project. Marchand served as technical consultant for Jeanne Agnew and John Jobe from Oklahoma State University at Stillwater, who did the project for MAA.

The program is suitable for students from ninth grade up. It requires logical and decision-making skills and arithmetic. For most problems, there isn't one correct answer; rather, there are a number of possible solutions. The students are encouraged to come up with different answers and to defend them. Geography lessons are embedded within the program, since examples deal with various parts of the U.S. Students are also encouraged to discuss their work and to write a report. These activities sharpen the students' oral and written communication skills. Students learn about real-world problems and use a variety of techniques to solve them.

OL'GA ARSEN'EVNA OLEINIK

by Yu. V. Egorov, A. Yu. Ishlinskii, A. S. Kalashnikov, A. N. Kolmogorov, O. B. Lupanov, and S. P. Novikov
reprinted from *Moscow University Mathematics Bulletin*, Vol. 40(1985), No. 4, pp. 95-104

Thanks to Lee Lorch for bringing this to our attention.

Ol'ga Arsen'evna Oleinik, an outstanding Soviet mathematician and head of the Department of Differential Equations, has recently marked her 35th anniversary at Moscow State University.

Oleinik was born in the town of Matusov (Kiev Oblast). In 1942, she graduated from secondary school in Perm and entered the faculty of Physics and Mathematics at Perm University. She combined her university studies with work in a defense factory, for which she was awarded an Honor Diploma by the Perm Regional Committee of the Young Communist League "For Selfless Labor During the Great Patriotic War [World War II]."

In 1944, Oleinik transferred to the faculty of Mechanics and Mathematics of Moscow State University. Here she participated in the seminar conducted by I. G. Petrovskii. Her contact with Petrovskii determined the direction of her own work to a considerable extent. In 1947, she graduated from the faculty of Mechanics and Mathematics with honors, and entered the graduate program at the Institute of Mathematics of Moscow State University. Her advisor was I. G. Petrovskii. In 1950, Oleinik defended her Candidate Dissertation, *On the Topology of Real Algebraic Curves on an Algebraic Surface*, and just four years later she defended her Doctoral Dissertation, *Boundary Value Problems for Partial Differential Equations with a Small Parameter in the High-Order Derivatives, and the Cauchy Problem for Nonlinear Equations in the Large*. Since 1950, all of her activity has been closely linked to the Faculty of Mechanics and Mathematics of Moscow State University, where she was employed first as an assistant, then as a docent, a professor, and (since 1973) head of the Department of Differential Equations. From 1948 to 1961, she was also an associate of the Steklov Mathematics Institute of the Academy of Sciences of the USSR; since 1965 she has held a joint appointment as a senior scientific associate of the Institute of Problems of Mechanics of the Academy of Sciences.

Oleinik has authored 227 published papers, including two monographs. Eight survey papers published in *Uspekhi Matematicheskikh Nauk*, are, in effect, separate monographs themselves. In terms of their content, her work pertains chiefly to the theory of partial differential equations, mathematical physics, and algebraic geometry.

Oleinik's papers on algebraic geometry [2-9], written in 1948-1951 (some in collaboration with I. G. Petrovskii), contain answers to a number of issues involving Hilbert's 16th problem. Bounds are obtained for the Euler characteristic of an (n–1)-dimensional algebraic surface of order m in n-dimensional projective space (the Petrovskii-Oleinik inequality); the position of an algebraic curve on an algebraic surface in three-dimensional space is investigated; bounds are given for the number of pieces of an algebraic surface of order m in n-dimensional space (an analog of Harnack's theorem).

Oleinik's research in the theory of partial differential equations encompasses many areas of this important field of modern mathematics.

In paper [1], which dates to her student years, Oleinik establishes that the regularity criterion for boundary points, obtained by Wiener for the Laplace equation, remains valid for any second-order elliptic equation with sufficiently smooth coefficients. Subsequently, for a general linear second-order elliptic equation, she proved a lemma [11] regarding the derivative of the solution at a point of the boundary extremum, which found a variety of applications.

In [10, 12, 15], Oleinik became the first Soviet mathematician to investigate the behavior of the solutions of boundary value problems for elliptic equations with a small parameter in the high-order derivatives.

A number of Oleinik's studies [18-20, 22, 25-28, 30, 36, 37] deal with discontinuous solutions of quasi-linear hyperbolic equations, which are the model equations for gas dynamics. For a general first-order quasi-linear equation, she constructed in [22, 27] a complete theory of discontinuous solutions: she provided a definition of the generalized solution of the Cauchy problem, including a condition analogous to the increasing-entropy condition; she demonstrated the existence and uniqueness of the generalized solution; she examined the structure of the set of its discontinuity points; and she showed that generalized solutions can be obtained by the method of "vanishing viscosity." Oleinik's studies are part of the fundamental research in the theory of discontinuous solutions of nonlinear equations.

In [60, 62, 70, 74, 91, 93-96, 102], Oleinik constructed a theory of linear second-order equations with nonnegative characteristic form, i.e., elliptic equations which can degenerate arbitrarily on some subsets of closure of the domain under consideration. For the general equation with nonnegative characteristic form, she proved the uniqueness of the generalized solution of the first boundary value problem, by solving a problem that had been posed earlier by the famous Italian mathematician Fichera. Oleinik also constructed a generalized solution of this problem, investigated its smoothness, and obtained (jointly with her student E. V. Radkevich) the hypoellipticity conditions for equations with nonnegative form.

In [68, 83, 90], Oleinik investigated the Cauchy problem and the mixed problem for second-order linear hyperbolic equations with an arbitrary set of degeneracy, establishing exact requirements on the coefficients which ensure that these problems are correctly posed.

Oleinik and Radkevich discovered a new approach to the problem of analyticity of the solutions of linear equations and systems, associated with Hilbert's 19th problem. This approach is based on derivation of an *a priori* estimate for the analytic continuation of the solution into the complex domain for equations that have only analytic solutions. Papers [99-101, 103-105, 116, 117, 121] identified extensive classes of systems that possess nonanalytic solutions, and also indicated new classes of systems all of whose solutions are analytic. A similar approach, combined with the introduction of an additional independent variable, made it possible to prove theorems of Phragman-Lindelof and Liouville type for general elliptic and parabolic systems in unbounded domains [110, 112, 118, 119]; to obtain bounds for the eigenfunctions and solutions of general elliptic boundary value problems with a parameter [107, 113]; and to describe classes of uniqueness of the solutions of general boundary value problems in unbounded domains and of boundary value problems without initial conditions for parabolic systems [120, 123].

A method proposed by Oleinik that has proved very fruitful is the method of introducing a parameter to investigate evolutionary equations [125, 126, 159, 160]. For example, this method has been used to prove uniqueness theorems of Tikhonov and Teklind type for general boundary value problems for parabolic systems, and to obtain bounds for Green's functions of general parabolic boundary value problems at infinity and near the initial hyperplane.

A characteristic feature of the work of both Petrovskii, Oleinik's teacher, and of Oleinik herself is an interest in applied problems. Many of the above results are related to applications. A number of Oleinik's other studies have a direct bearing on mathematical physics.

Paper [31] became the starting point of the mathematical theory of nonstationary filtration of fluids in porous media. Filtration processes are described by nonlinear parabolic equations that degenerate for certain values of the unknown function or its derivatives. For nonstationary filtration equations, Oleinik provided the definition of the generalized solution of the Cauchy problem, proved its existence and uniqueness, and studied the properties of the generalized solutions. In subsequent years, these results were elaborated by many Soviet and foreign mathematicians.

For the equations describing processes of heat transfer under conditions involving several phase states with unknown interface surfaces (Stefan problem), Oleinik proposed [46, 65] a new solution method, involving the construction of a family of quasi-linear equations with specially smoothed coefficients, and subsequent passage to the limit.

In [53, 55-58, 69, 71-73, 75, 77-82, 86-89, 92, 97, 98], Oleinik constructed a mathematical theory of the boundary layer; she demonstrated the existence, uniqueness, and stability of the solutions of the fundamental problems for the stationary and nonstationary systems of equations, proposed by Prandtl in 1904, describing the boundary layer in an incompressible viscous fluid; she studied the asymptotic properties of the solutions; and she provided a validation of the finite-difference method and of other approximate methods.

In problems of inelasticity theory, Oleinik (jointly with her student G. A. Iosif'yan) validated Saint-Venant's principle for bodies of arbitrary shape, according to which the energy in a self-equilibrated elastic solid should decrease rapidly with increasing distance from the point of application of the forces; using this principle, she investigated boundary value problems in unbounded domains for the system of equations of elasticity and for the biharmonic equation, and studied the asymptotic behavior of the solutions at infinity and in the neighborhood of singular points of the boundary [136, 141, 143, 146, 147, 149, 154, 170-173]. In particular, she solved the long-outstanding problem in elasticity of the conditions that ensure exponential decrease at infinity of the solution of the system of elasticity theory with finite energy in an unbounded cylinder.

In [184, 191, 204, 211, 213], Oleinik investigated the smoothness of the generalized solutions of the biharmonic equation, of the system of Navier-Stokes equations, of the system of Karman equations, and of certain other classes of equations in plane domains with nonsmooth boundaries; in addition to other results, she obtained the definitive solution of the problem of the nature of the singularity at the endpoints of a crack for the solution of the biharmonic equation with Dirichlet boundary conditions.

A large cycle of Oleinik's studies deals with the mechanics of strongly inhomogeneous media, when it becomes necessary to construct averaged models. This requires investigation of a family of differential equations with rapidly oscillating coefficients, and determination of an averaged equation whose solutions are the limits of the solutions of the equations of the family under consideration. In conjunction with these problems, Oleinik developed the theory of G-convergence of differential operators; in particular, she obtained averaged equations for families of elliptic and parabolic equations with almost-periodic and random rapidly oscillating coefficients [169, 176, 180, 182, 185, 186, 196]. In [193, 197, 201, 202, 205, 206, 212, 214, 216, 217], Oleinik and her students G. A. Iosif'yan and A. S. Shamaev investigated the averaging of the boundary value problems for the system of elasticity theory in perforated domains, i.e., in domains with large numbers of small cavities; estimates were obtained for the deviation of the solutions of the boundary value problems from the solutions of the averaged system, as well as estimates for the deviation of the corresponding energy integrals, stress tensors, and natural vibration frequencies. For domains with plane boundaries and for the Dirichlet problem, complete asymptotic expansions of the solution in powers of a small parameter (cell size) were obtained. In connection with certain problems in averaging theory, there was a question regarding the behavior at infinity of the solutions of an elliptic equation, periodic in part of the independent variables and possessing a finite Dirichlet integral over the period (Sanchez-Palencia problem); this problem was solved by Oleinik jointly with V. A. Kondrat'ev [221, 226].

Oleinik's work has won wide recognition in the Soviet Union and abroad. She has been the recipient of the Chebotarev Prize (1952), the Lomonosov Prize, first degree (1964); she has been elected a foreign member of the Italian Academy of Sciences in Palermo, an honorary member of the Royal Society in Edinburgh (Great Britain), and has received an honorary doctorate from the University of Rome; she was awarded the medal of the College de France, and the medal of Charles University, first degree (Prague, Czechoslovakia). Her monograph [89] has been published in English in the USA. English and Italian translations of monograph [93] have been published. Oleinik has repeatedly participated in international congresses and conferences in mathematics, and has lectured at major universities in Europe, the USA, and Japan.

Oleinik's considerable talents as a teacher is evident in her work at Moscow University. Her basic course in partial differential equations is updated and improved every year. Her textbook [137] offers a fresh exposition of a number of issues in the program. Oleinik is in charge of several research and scholarly seminars. On average, ten students complete their course and diploma studies each year under her advisorship. For each of her many students — from third-year students to graduate and advanced graduate students — she is able to find new and scientifically interesting problems that are within their abilities. Under her advisorship, more than 40 Candidate Dissertations have been written and defended; six of her students have become Doctors of Sciences and professors. Her students are active in many republics of the Soviet Union and abroad — in Bulgaria, Hungary, the German Democratic Republic, Czechoslovakia, Vietnam, and the People's Republic of China.

Oleinik has been the prime mover behind the translation into Russian of six monographs and textbooks of important foreign scholars; she is also the titular editor of these publications. The appearance of these books in Russian helped to improve the quality of instruction in the theory of differential equations in Soviet universities, as well as to stimulate the development of research in this area.

Oleinik assisted I. G. Petrovskii in the writing and revision of his textbooks: *Lectures on the Theory of Ordinary Differential Equations*, *Lectures on the Theory of Integral Equations*, and *Lectures on Partial Differential Equations*. The first two were republished in 1984, after Petrovskii's death, under the editorship of Oleinik. She prepared two volumes of the *Selected Works of I. G. Petrovskii* for publication.

On Oleinik's initiative, in 1973 the Faculty of Mechanics and Mathematics organized the Petrovskii Seminar on Differential Equations and Mathematical Problems of Physics. Oleinik was the initiator of the All-Union Conference on Partial Differential Equations, held in 1976, which marked Petrovskii's 75th birthday. In response to a proposal by Oleinik, since 1978 there have been yearly joint sessions of the Petrovskii Seminar and the Moscow Mathematics Society; these sessions actively involve large numbers of prominent mathematicians, physicists, and specialists in mechanics from various parts of the Soviet Union.

As the head of the Department of Differential Equations, Oleinik pays much attention to teaching methods, to improvement of the programs of the general and specialized courses, and to teaching aids and course material. Oleinik's work as a public figure has been extensive. She is a member of the board of the Moscow Mathematics Society, the editor-in-chief of the journals *Trudy Moskovskogo matematicheskogo obshchestva* and *Trudy Seminara imeni I. G. Petrovskogo*, assistant editor-in-chief of the journal *Uspekhi matematicheskikh nauk*, a member of the editorial board of *Vestnik Moskovskogo Universiteta*, and also a member of the board of the international journals *Applicable Analysis* and *Communications in Partial Differential Equations*. Oleinik has been awarded a medal by the World Peace Council for active participation in strengthening peace between peoples, and an honorary diploma by the Soviet Committee for the Defense of Peace.

Oleinik possesses a great amount of personal charm. Sympathy, kindliness, and a sense of tact are combined with an adherence to principle and a strong enthusiasm for work.

Oleinik continues to be full of creative energy and scientific plans. We wish her many years of fruitful activity and major new successes.

BIBLIOGRAPHY: For [1] through [31], see *Mathematics in the USSR over the Past 40 Years*, vol.2 , Moscow, 1959; for [32] through [79], see *Mathematics in the USSR 1958-1967*, vol. 2, no. 2, Moscow, 1970; for [80] through [128], see Vestnik Moskovskogo Universiteta. Matemitaka, Mekhanika [Moscow University Mathematics Bulletin], no. 4, 122-124, 1975; for [129] through [227], see Vestnik Moskovskogo Universiteta. Matematika [Moscow University Mathematics Bulletin], no. 4, 99-104,1985.

RESOURCES AVAILABLE FROM THE AWM OFFICE

About thirty people a week write to AWM requesting information about women and mathematics. Their questions vary widely — some are certainly unique — but the more common inquiries have led to the development of a variety of booklets and other materials. We are listing these here to let you know what your membership in AWM supports, and so that you may order items that are of interest to you.

Information Packet for the Sonia Kovalevsky High School Day. Information and guidelines for setting up a program for high school students and teachers in your area. FREE.

Speakers' Bureau Directory. Lists over 200 speakers for colleges, high schools, and other audiences; includes sample speech topics and suggested audience levels. FREE.

Directory of Women in the Mathematical Sciences. Lists women by mathematical specialty, geographical area, and alphabetical order. $3 for AWM members, $5 for non-members.

Bibliographies on Women and Mathematics. The bibliographies sponsored by the Joint Committee on Women in the Mathematical Sciences and initiated by WAM are available from AWM. They are continually begin updated, so please feel free to contribute information (annotation requested) about books or selected articles. FREE (25¢ stamp requested).

- Resources for Students/Career Information
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FINANCIAL AID RESOURCE

Millions of dollars of financial aid scholarships, grants, and loans are available to students each year to help pay for their college education. A newly revised version of *Financial Aid: A Partial List of Resources for Women* is designed to help women learn about and obtain their fair share of this financial assistance. Published by the Project on the Status and Education of Women of the Association of American Colleges, the booklet details programs available to high school students applying to college, older women, minority women, women considering traditionally male careers, and others at all levels of postsecondary education.

The booklet contains information on: different kinds of colleges and universities; what types of programs are available; how to find out about sources of financial aid on campus and in the community; how to get credit for former courses and "life experience;" tips on cost-cutting ways to attend school; a selected listing of more than sixty financial aid programs, most of them geared specifically for women (including scholarships, grants, and loans offered by the federal government, private foundations and corporations, and individual institutions); and a resource section listing sixty-eight books and pamphlets that can help students locate money for college.

"There are many financial aid dollars currently available to women students, no matter what their educational goals or financial situations," says Julie Kuhn Ehrhart, author of the booklet. "We hope the programs, resources, and general advice we're providing will be a useful starting point for women students in their search for these dollars." *Financial Aid: A Partial List of Resources for Women* is available for $3.50 (prepaid) from AAC/PSEW, 1818 R St., NW, Washington, DC 20009. Bulk rates are available.

PENN FOUNDATION GRANTS

by Cindy Schmalzried, graduate student, Bryn Mawr College

The alarm has been sounded (once again) in the government's *A Nation at Risk* study that math and science achievement in this country is very low. We all realize that there is a crisis in math and science education, that the public schools lack skilled teachers, adequate laboratory facilities, and sufficient time to teach these subjects. One private organization which is responding to this need is the William Penn Foundation, which is located in Philadelphia.

A long-time supporter of educational programs, this foundation began a project in 1985 to provide funds for several math and science summer enrichment programs to be held on college campuses in the Philadelphia area. This summer, eight colleges and universities will be involved.

The charge from the William Penn Foundation is to provide math and science enrichment activities to middle-ability students in grades 9-12. These activities should not duplicate the school curriculum or be remedial in nature. In addition to the math and science focus, the curriculum should seek to improve writing skills. The program must include follow-up activities to reunite the students during the school year following their summer experience. Finally, the program is also expected to provide learning experiences for high school teachers in these school districts.

Each college has met the challenge in a different way. Bryn Mawr's "Windows into Science Enrichment" (WISE) concentrates mostly on science education and involves many of the College's science faculty members. The University of Pennsylvania's Summer Space program has a central theme of "space" as a focus for its activities. Swarthmore's "Adventures in Math and Science" (AIMS) has an extensive writing component in which students use Macintosh computers to assist the writing process.

Each program uses college personnel to a greater or lesser degree and employs local high school teachers. Students from the Philadelphia school district and some surrounding districts are accepted and are paid a stipend to make up for loss of income from summer jobs. Low economic level is not the guiding factor in admissions, however. Rather, the program targets students in the middle range of ability who miss out on both programs for the gifted and remedial programs.

I have been involved with the AIMS program at Swarthmore College since its inception in 1986. Each summer, we enroll approximately 50 middle-ability 9th and 10th graders. We attempt to balance race and gender, usually ending up with a few more girls and a few more minority students. By choosing many of these students from the nearby depressed city of Chester, we are able to strengthen ties between that city and the College. We do not necessarily seek out highly motivated students, as do some of the other colleges; instead, we attempt to provide motivation for them to take back with them in the fall.

We employ a counselor and mathematics, biology, and writing teachers from the same schools attended by the students. They help us follow up on students during the school year. In addition, teachers participate in methods workshops and planning sessions for a week before the students arrive, giving them new ideas with which to return to school in the fall. Also participating in the planning week are Swarthmore students who are hired as teaching assistants and dorm counselors.

Many members of the College community assist the AIMS program. An education professor was instrumental in establishing AIMS and continues to work with writing and biology teachers and with the Swarthmore students. Several biology professors give lectures and demonstrations and assist the biology teachers. An English professor leads a popular workshop on poetry writing. An astronomy professor gives tours of the night sky through the College Observatory telescopes. The staff of the Scott Arboretum, which is located on campus, provides botanical activities. The Department of Computing Services provides Macintosh labs which we use extensively for class work and to produce weekly newsletters and a literary magazine.

The mathematics component of the curriculum emphasizes problem-solving and pattern-finding. We concentrate on the use of mathematics to describe natural phenomena, such as the spiral appearance of the nautilus shell and the patterns of growth of pinecones and sunflowers. Students use the computer language Logo to investigate properties of arcs and polygons. A math professor with an NSF grant to produce videotapes for geometry instruction assists us as we build and explore polyhedra. We are hoping this year to add a chemistry lab centering on the three-dimensional properties of crystals.

I've been gratified to see the students' enthusiastic response to these mathematics classes. Although most have not yet begun the school system's secondary math curriculum, they exhibit good reasoning abilities and are able to discuss sophisticated concepts. Best of all, they enjoy the activities, so they leave AIMS with a predominantly positive attitude toward mathematics.

Of course, the AIMS program also includes physical and musical activities, as well as field trips to various locations. The students live on campus during the week, so we plan a special program for each evening. These include career planning and counseling activities, stressing values clarification and development of the individual. We meet with students on three Saturdays during the school year to continue activities of this sort and to discuss with students ways to succeed in their own schools. We work with the William Penn Foundation to keep track of our students during the succeeding years. It's too soon yet to report on any trends, but we are hoping our students will take more math and science courses before graduating from high school and will maintain the positive attitudes with which they leave our program.

OF POSSIBLE INTEREST

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Knox College. Dept of Math & CS, Galesburg, IL 61401. Tenure track Asst Prof position to begin 9/88. Required: PhD in math, commitment to excellence in teaching and continued scholarly development. Ability to teach introductory CS preferred. Preferred areas: analysis, topology, or geometry. Salary competitive. Load: 2 courses per term for 3 terms. Send letter of application, resume, grad transcript, and 3 letters of recommendation to Dennis M. Schneider, Chair.

Wheaton College. Dept of Math, Norton, MA 02766. 2 yr tenure track Asst Prof position to begin 9/88. Required: PhD in math science, commitment to quality teaching, active scholarly activity. Preferred areas: analysis, CS. Wheaton is a private liberal arts college of 1100 students. Send letter of application, vita, transcripts, and 3 letters of recommendation to Rochelle Leibowitz, Chair.

Northern Michigan University. Dept of Math & CS, Marquette, MI 49855-5340. Temporary and tenure track Asst Prof positions. All fields: math, math ed, statistics, and CS. Northern is primarily an undergrad institution and a commitment to teaching is essential. Scholarship and professional activity are encouraged and supported. Send resume, transcripts, and 3 letters of recommendation to Terrance Seethoff, Head.

Hamilton College. Dept of Math & CS, Clinton, NY 13323. Temporary 1 or 2 yr leave replacement position. Duties: teaching 6 courses/yr at small, highly selective, 4-yr liberal arts college. Excellence in teaching required. Send vita and 3 letters of recommendation, at least 1 about teaching, to Larry Knop, Chair. Women and minorities encouraged to apply.

Meredith College. Dept of Math & CS, 3800 Hillsborough St., Raleigh, NC 27607. Tenure trach Instr/Asst Prof position in CS. Required: Master's degree in CS, terminal degree or commitment to a PhD, evidence of excellence in teaching. Meredith is a private women's college of 2000 students. Send letter of application, resume, and names & addresses of 3 references to Virginia Knight, Head.

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