

Association for Women in Mathematics

Volume 12, Number 6

NEWSLETTER

November-December 1982

PRESIDENT'S REPORT

The Toronto Meeting. Our panel on "Women Mathematicians in Canada" was extremely interesting, especially to those of us from the United States. Cathleen Morawetz was the moderator, and the panelists were Alice Turner, Mary McLeish, Reine Fournier and Roberta Mura who spoke in that order. Alice Turner, a pioneer among women mathematicians in Canada, gave a fascinating account of her career starting from her student days about fifty years ago. Mary McLeish touched on adjustments that had to be made in a two-career family; she herself has switched fields to become a computer scientist. Reine Fournier talked about the difficulties facing the young woman mathematician who is also a mother, and has to raise children and maintain acceptable levels of research at the same time. Roberta Mura presented her own research on women mathematicians in Canada; the figures she presented, though depressing, were very informative because of the paucity of such statistics in Canada. The talks of the panelists will appear in the Newsletter.

The items of interest from the Executive Committee and Business Meetings are as follows. A Nominating Committee consisting of Susan Montgomery (Chair), Louise Hay and Pat Kenschaft was set up and will come up with a slate of candidates for the 1983 elections. It is proposed to appoint some Associate Editors of the Newsletter, who will help the Editor particularly as regards soliciting articles. Jeanne LaDuke has been appointed as the first Associate Editor.

The following motion was passed unanimously at the Business Meeting: AWM is pleased at the action passed by the AMS Council on August 22, 1982 concerning our long-time supporter and member, Prof. Chandler Davis, of the University of Toronto. The AWM President will consult with Prof. Andrew Gleason, President of the AMS, and will act on our behalf in this matter in any way she and Prof. Gleason consider appropriate.

The action referred to is that of the AMS urging the President of the USA to pardon Chandler Davis for his conviction for contempt of Congress (during the McCarthy era).

A motion that AWM endorse a resolution on the nuclear freeze was defeated.

It was decided at the Business Meeting that the Treasurer of the AWM look into the expense of printing a list of AWM members. Subsequently we have made some inquiries, and we are trying to determine how many members would be willing to buy such a directory for \$3, as this would help cover our expenses. You will see a question about this on the next page; please respond to it.

The Executive Committee appointed Judy Wason as Director of the Speakers' Bureau for the period of the Sloan Foundation Grant (see the last Newsletter). Judy Wason worked on our Speakers' Bureau some years ago, and we are fortunate to have her directing it at this time.

It was decided not to increase dues, but we propose to create a new institutional membership whereby an institution can sponsor a certain number of graduate students.

We had reports from our NSF Committee and Mathematics Education Committee. The NSF Committee, composed of Pam Ferguson, University of Miami, reports that during the

fiscal year 1981, 1300-1400 individuals received NSF grants and out of these 50 were women. NSF would like more women reviewers of proposals, and anyone interested should contact Pam Ferguson. Evelyn Silvia, who chairs the Education Committee, has written two guest columns for the WME Newsletter. We hope to have a continuing cooperation with WME.

Denver. An AWM panel on "Mathematicians and Computers" will be held on Thursday, January 6, 1983 from 11:15 a.m. to 12:15 p.m. at the Denver meeting of the AMS/MAA. The panelists will be Lucy Garnett, Louise Hay, Marci Pelstadt and Nancy Johnson. The speakers will describe their experiences in the use of computers in various aspects of mathematical life: research, administration and teaching. The panel will be followed by our Business Meeting from 12:15 p.m. to 12:55 p.m. We will have a party that evening around 6 p.m. On Friday morning or Thursday afternoon (please check the AMS Notices) we have our fourth Emmy Noether Lecture, to be given by Cathleen Morawetz. We are delighted to have Prof. Morawetz as our Noether Lecturer. In this context, the Noether Lecture Committee invites suggestions for future Lecturers.*

I hope to see many of you at the Denver meeting. In particular, please help by staffing the AWM Table when convenient for you. We have found that having a continuous presence at the table helps us enormously with recruiting new members.

Other news. Ellie Palais will represent AWM at a Special CBMS Meeting at Washington, D.C. on "The Mathematical Sciences in K-12: What is Still Fundamental and What is Not?".

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

* Contact Professor Linda Keen, 180 Ames Ave., Leonia, N.J. 07605.

AWM DIRECTORY

We are hoping to publish a directory of all members of AWM. If you do not wish your name included, please notify Margaret Munroe, Administrative Assistant, AWM Office, P.O. Box 178, Wellesley College, Wellesley, MA 02181. Also please let us know if you are interested in buying a copy of this directory at a cost of \$3.00. The number of directories requested will determine the number we have published. Only those members who have paid their 1983 dues before Dec. 1, 1982 will be included in the directory. Please give your preference:

I do/do not want my name to be included in the directory of AWM members.

I would/would not be interested in buying a copy for \$3.00.

If we do not hear from you by December 1, 1982, we will assume you have no objection to being included in the directory.

CORRECTION

There are two minor changes in Sennott's "Queueing Networks" article in the last issue of the Newsletter. (The changes arrived when we were in press.)

1. Page 13, line -5. Change "around 1920" to "in 1909".
2. Page 14, line 7. Omit "which is assumed positive". Add the new sentence "Conditions are placed on the routing probabilities p_{ij} which guarantee that every entering customer will eventually leave the network."

REPORT OF THE TREASURER: August 24, 1982

Accounting for the period June 1, 1981 - May 31, 1982

Balance, June 1, 1981 \$8,769.95

Receipts

Dues - Individuals	\$10,180.67
Families	840.00
Institutions	2,400.00
Advertising fees	605.00
Contributions	351.00
Interest	635.45
Miscellaneous (1)	<u>8,010.19</u>
	\$23,022.31

Expenses

Wages & FICA (2)	\$5,609.98
Newsletters (3)	3,850.45
Dues & fees (4)	290.00
AWM meetings (5)	161.33
Operating expenses (6)	1,432.81
Miscellaneous (7)	<u>6,292.77</u>
	\$17,637.34

Balance, May 31, 1982 \$14,154.92

- (1) This includes \$1104.09 received as reimbursement for credit towards secretarial services to organizations other than AWM and a \$1000 IBM Travel Grant and \$5689.70 reimbursement from the AWM's NSF grant for the Emmy Noether Symposium.
- (2) Part-time secretary and student helper
- (3) Typing, postage, and printing for 6 issues
- (4) CBMS (Conference Board of the Mathematical Sciences), Massachusetts Incorporation fee
- (5) Postage and refreshments
- (6) Postage, phone, supplies, and duplicating
- (7) This covers \$534.26 in credit towards supplies and secretarial services to organizations other than AWM, \$200 in IBM travel grants, and \$5299.35 in Emmy Noether Symposium expenses.

Membership Statistics: Our mailing list totals around 1050, including institutions and members in Canada and abroad.

Respectfully submitted,

Donna L. Beers, Treasurer

WOMEN MATHEMATICIANS IN CANADA

AWM panel at Toronto meeting, August 25, 1982

Roberta Mura, Faculty of Education, Laval University, Quebec City

Canada is one of the nine countries who have contributed a report to the recently published International Review on Gender and Mathematics [1]. It is clear from the report that although interest in the subject of women and mathematics seems to be growing, so far only relatively few people have done research specifically in this field. In fact, much of the work accomplished was set within some larger context. In 1980, for instance, the Science Council of Canada organized a workshop on the science education of women and many of the papers presented there concerned the mathematics education of women as well as their science education [2].

The following data, published by Statistics Canada, can give a good idea of the extent of the problem. In 1979-80, women constituted 15% of full-time university teachers, but only 4.5% of those in Mathematics and Physical Sciences. In 1980, women received 50% of the Bachelor's degrees, 37% of the Master's degrees and 23% of the Ph.D.'s awarded by Canadian universities; the corresponding figures for degrees in Mathematics and Physical Sciences were 28% (Bachelor's), 17% (Master's) and 8% (Ph.D.'s).

Statistics from previous years show that progress in the percentage of women among Mathematics and Physical Sciences faculty has been extremely slow: from 3.6% in 1958-59 to 4.5% in 1979-80. Progress in the percentage of women among those receiving a Ph.D. in Mathematics and Physical Sciences has been both slow and unsteady: from 3% in 1962 to 8% in 1980, with remarkable ups and downs in between.

Of course statistics are only the starting point: they raise more questions than they answer. The most obvious question, although by no means the only one worth investigating, is: Why are there so few women scientists?

What is clear by now is that there is no one single reason why this is so. Rather, the situation is due to many different factors interplaying with each other in a complex way.

I have tried to group into large categories the factors that have received the most attention in Canada as possible explanations of the low participation of women in mathematics (and science):

- economic factors
- educational factors
- psychological factors
- social factors
- cultural factors.

Economic factors. Looking at the evolution of the percentage of women Ph.D.'s over the years, it is very tempting to associate it with certain historical events: the percentage increases dramatically during the 1920's on the wave of an expanding economy (and a strong feminist movement), it goes down with the depression that followed, up again during the Second World War, down again immediately after it, and so on. It was only in 1975 that the percentage rose again to its peak value of 1930 and overtook it!

More evidence of the influence of economic factors comes from Quebec studies showing that women studying or teaching mathematics and pure sciences at the university level come from higher social classes than their male counterparts.

Educational factors. In their book But Can You Type? Canadian Universities and the Status of Women [3], Jill McCalla Vickers and June Adam wrote:

"Almost from the cradle on, Canadian girls are presented with images of occupations appropriate for them. These images rarely lead girls to even contemplate careers in traditionally male fields. And because few girls contemplate careers in fields traditionally closed to women, they tend not to qualify themselves appropriately for entrance to programs leading to such careers. For many, the discovery of alternatives to the traditional female careers comes too late because they are unprepared, most often in the physical sciences and mathematics." (p. 134)

I will give two examples of studies that have confirmed this analysis. The first one shows that girls are indeed led to think that only certain occupations are appropriate for them. The second one shows that young women do tend not to qualify themselves appropriately for entrance to scientific programs in universities.

Investigations of school textbooks carried out in Quebec in 1976 and in Manitoba in 1980 have yielded remarkably similar results: male characters are represented in five times as many different occupations as female characters are. Male occupations include mathematician, engineer, scientist and other professions requiring mathematics, while no female characters are portrayed in such professions. Thus school textbooks present children with the image of a society even more heavily stereotyped than the real one.

The British Columbia Mathematics Assessment of 1977 showed that only 42% of the Mathematics 12 students were female, while 64% of those whose last mathematics course was Mathematics 10 were female. Similar data have been reported in Ontario. Thus women seem to begin to drop out of mathematics one or two years before entering university.

Psychological factors. I will give just one example here. In 1977, Dr. David Robitaille from the University of British Columbia carried out a study comparing boys' and girls' degree of self-confidence in their methods of performing the four basic operations with their actual performance. The study involved over 5000 children from grades 5, 6, 7, and 8. Despite the fact that the girls consistently outperformed the boys as regards achievement, in only 3 out of 20 cases was the girls' mean self-confidence score greater than that of the boys.

Social factors. Socialization can affect girls' involvement in science by two quite different routes. First, the social roles imposed on a growing child may either discourage or foster activities which contribute to the development of mental abilities and character traits useful in the learning and practice of science. Secondly, the child's image of a scientist, regardless of its accuracy, may appear compatible or at odds with her image of the person she wants to become. Thus socialization may affect either the real abilities required for the practice of science, or the child's image of what a scientist is and her interest in becoming one. ([2], p. 63)

Other social factors playing a role in keeping down the number of women in mathematics include discrimination in employment and promotions, sexual harassment at colleges and universities, and conflicts between private and professional life (examples of which have been given by other members of this panel).

Cultural factors. These are the hardest to study experimentally and the hardest to fight. In my opinion, they are among the most powerful ones. The cultural tradition that Canada shares with the rest of the western world, in the form of religions, philosophy, literature, arts, etc., from classical Greece to present day popular media, presents women and girls with an image of themselves that is not conducive to engaging in intellectual pursuits, especially scientific ones, nor to seeking success outside the private sphere of life.

Of course we cannot shield our daughters and students from our own culture. However, we can discuss it with them, we can make them become critical about it, and we can give them all the extra support they need in order to realize their full human potential, including their mathematical one.

Remark. It was noticed by one of the participants that I had not included in my list a category of biological factors. I omitted it on purpose, because this kind of explanation for the low participation of women in mathematics has not received as much attention in Canada as in the U.S.A. and because discussion concerning biological factors has been based essentially on research done abroad. (Unfortunately, news of such research has sometimes been reported in the Canadian press in a sensational way.)

In concluding her survey of the research on the biological origin of sex differences in intellectual ability [2], Dr. Meredith Kimball from Simon Fraser University wrote:

"A disproportionate amount of energy has been spent examining biological explanations that have very little or at best mixed evidence to support them. Most of the literature suggests that the observed differences are very small,

and the overlap of the population distribution is large. We have been asking the wrong questions for too long. It is time we stop debating how large the sex differences are, if they exist at all, or where they come from. We must focus on the important question: Why is it that the difference in participation of men and women in scientific fields is so large, when sex differences in intellectual abilities are so small?" (p. 59)

References

- [1] Erika Schildkamp-Kündiger (Ed.), An International Review on Gender and Mathematics, ERIC/SMEAC, The Ohio State University, Columbus, Ohio, 1982.
- [2] Janet Ferguson (Ed.), Who Turns the Wheel?, Proceedings of a Workshop on the Science Education of Women in Canada, The Science Council of Canada, 1981. (Available free of charge from: The Publications Office, Science Council of Canada, 100 Metcalfe Street, Ottawa, Ontario K1P 5M1, Canada.)
- [3] Jill McCalla Vickers and June Adam, But Can You Type? Canadian Universities and the Status of Women, Clarke, Irwin & Company Ltd. in association with the Canadian Association of University Teachers, 1977.

Alice W. Turner

Your invitation to participate in this Panel is deeply appreciated, particularly since my work in Mathematics began long before many of you were born. Besides, fantastic developments in Mathematics have occurred and greatly increased opportunities for women with mathematical training.

Information about pioneer women mathematicians in Canada is sparse. But it can be safely assumed, I think, that they were given little encouragement or opportunity to engage in University teaching or research.

As one of the survivors of this group, I'm taking the rather presumptuous liberty this morning to describe some of my own experiences, circumstances and associations. Perhaps this approach can serve as a springboard for interesting questions and comments from you later on.

Fifty years or so ago, there were very few women in Mathematics at Canadian universities, either as staff or as Honours students. For example, at McGill University in my freshman year there were no women on the mathematical staff and only 2 of us in the Honours course in Mathematics and Physics combined. In my sophomore year, I dropped Physics and took Honours in Pure Mathematics and a minor in Philosophy--leading to B.A. and M.A. degrees. McGill had no doctoral programme in mathematics so I went to the University of Toronto which did offer a Ph.D. in Mathematics. Fortunately, I had a teaching Fellowship worth \$700 plus free tuition.

At Toronto there were 2 women on the Mathematics staff. Mary Waddell, the first woman appointed to Mathematics at Toronto, had been there over 25 years. She had an M.A. from Bryn Mawr and later qualified as a lawyer here in Ontario. A remarkably fine teacher, she acquired a university-wide reputation for her amazing success in helping young men who returned from the First World War to pass Mathematics needed for admission to University. Incidentally, Mary Waddell was an extremely astute investor and amassed considerable wealth.

Then there was Cecilia Krieger, a much younger woman, who became the first woman to receive a Ph.D. in Mathematics at U. of T. She may be familiar to some of you for her translation from Polish into English of Sierpinski's "An Introduction to General Topology". Dr. Krieger, later Dr. Dunaj, was an outstanding teacher and ultimately became an Associate Professor.

My teaching Fellowship was renewed for a second year and when I was well along on my thesis in Analysis, I had the good fortune to win an Overseas Scholarship (worth \$1,600) and spent the next year in England at Cambridge University. Women there belonged to either Girton or Newnham, the two women's colleges. I chose Newnham because it was more centrally located. There were 3 or 4 women on Newnham's own Mathematical staff, but we could take courses or do research with Professors throughout the University. I

took a course in Real Variable Theory with the renowned J.E. Littlewood and a course in Relativity with Sr. Arthur Eddington. My intention to take a course in Philosophy with Professor Joad fell through because he would allow no women in his class.

Newnham graduate students didn't live in the College, but they were required to dine formally in the Hall once a week; I recall bicycling there in full evening dress regalia --a nerve-wracking journey for those who had not ridden bicycles as children.

We were also expected to attend evening sessions for all Newnham graduate students meeting together as a group. I happened to be the only Canadian and the only one in Mathematics. At these sessions, individuals described their own particular work and read a paper on some topic in their field, and we discussed scholarly work of general interest. Through these illuminating sessions, I began to regard Mathematics not as a self-contained discipline in its own right, so to speak, but rather as an essential element in the mainstream of human thought--linked with natural science, social science and humanities, including art, music, and philosophy. A similar broad view of Mathematics seems fairly widespread today--perhaps partly due to spectacular growth in computer science and technology.

Following a marvellous year at Cambridge, I returned to Toronto and completed work for the Ph.D. This was in 1932--the very depth of the depression. All efforts to secure a position in Mathematics--or in Philosophy--at any Canadian University proved futile. Besides, as far as I know, there were no post-doctoral Fellowships or special grants available then. So I was compelled to seek employment wherever I could find a job. Before long, I found myself in Ottawa at Statistics Canada--working under M.C. McLean, a quiet Scot with excellent mathematical training. Under his direction I studied Statistical theory and worked on methods and ideas underlying Gross National Product, sampling and so forth. Mr. McLean and I published a paper dealing with the Logistic Curve and Canada's Population Growth.

After 5 years in Ottawa, I moved to Toronto as Statistician in one of Canada's largest investment firms. Before long, with the outbreak of the Second World War in 1939, many of the firm's key personnel joined the Armed Forces or otherwise engaged in the war effort. My responsibilities enlarged to include frequent trips representing the firm at meetings with prominent government officials and experts in economics and finance --mostly in Ottawa and sometimes in New York. Several of the people were women. In Ottawa, I recall a discussion led by the brilliant Dr. John Deutsch, father of our panelist Dr. McLeish.

After the war, the firm's business expanded rapidly to meet mounting demands for capital investment and dramatic changes in both domestic and international finance. Relevant statistical analysis and research assumed new importance in the firm. One interesting project took me to London and Edinburgh, with a side-trip to Kilmarnock, where I visited a distillery. I recall, as a memento of my visit, being presented with a bottle of its famous Scotchwhiskey.

In 1960 an opportunity came to return to the academic life I had initially intended to pursue. The newly-founded York University offered me a part-time position in Mathematics. I accepted and embarked on a venture that seemed a foolhardy risk to some of my associates. York's faculty totalled only 14 and I was the only woman; there were 76 students enrolled, all in first year. Briefly, the venture led to a full-time position in Mathematics the following year, and I continued there for another 16 very rewarding years, until I retired.

Since retirement, I have continued as a Director of a life insurance company and am now quite busy as Chairman of the Board. Also, I conduct a correspondence course in Statistics for the Continuing Education Division of the University of Toronto.

In conclusion, my interest in Mathematics, directly and indirectly, reflects Alfred North Whitehead's claim that mathematics plays a role in the history of thought comparable to the role of Ophelia in Shakespeare's Hamlet. In Whitehead's words, "Ophelia is quite essential to the play, she is very charming and a little mad."

Thank you for your attention.

Merci pour votre attention.

LETTER TO THE EDITOR

At the Toronto business meeting of AWM a motion that we pass a resolution advocating that the U.S. work with the U.S.S.R. for a verifiable, bilateral nuclear freeze and for a reduction of nuclear weapons was introduced. Because of the small number present (less than 5% of the membership) and because there had been no prior notice that such a motion would be introduced, some of those present voted against the motion or abstained. Others were concerned about compromising the non-political status of AWM. The motion was defeated.

A different motion will be introduced at the Denver business meeting of AWM. This motion will propose that AWM go on record as endorsing the resolution on Nuclear War and Arms Control passed by the National Academy of Sciences (a non-political body). The text of this resolution follows.

--Whereas nuclear war is an unprecedented threat to humanity;

--Whereas a general nuclear war could kill hundreds of millions and destroy civilization as we know it;

--Whereas any use of nuclear weapons, including use in so-called "limited wars," would very likely escalate to general nuclear war;

--Whereas science offers no prospect of effective defense against nuclear war and mutual destruction;

--Whereas the proliferation of nuclear weapons to additional countries with unstable governments in areas of high tension would substantially increase the risk of nuclear war;

--Whereas there has been no progress for over two years toward achieving limitations and reductions in strategic arms, either through ratification of SALT II or the resumption of negotiation on strategic nuclear arms;

Be it therefore resolved that the National Academy of Sciences calls on the President and the Congress of the United States, and their counterparts in the Soviet Union and other countries which have a similar stake in these vital matters;

--To intensify substantially, without preconditions and with a sense of urgency, efforts to achieve an equitable and verifiable agreement between the United States and the Soviet Union to limit strategic nuclear arms and to reduce significantly the number of nuclear weapons and delivery systems;

--To take all practical actions that could reduce the risk of nuclear war by accident or miscalculation;

--To take all practical measures to inhibit the further proliferation of nuclear weapons to additional countries;

--To continue to observe all existing arms control agreements, including SALT II; and

--To avoid military doctrines that treat nuclear explosives as ordinary weapons of war.

Christine Ayoub, Penn State

SIAM NEWS

A call for papers has been issued for the SIAM Symposium on the Applications of Discrete Mathematics, which will be held June 27-29, 1983, at the Massachusetts Institute of Technology. The symposium is intended to bring together researchers in the various fields of discrete mathematics with users of discrete mathematics in industry and government. The deadline for abstracts is December 1, 1982.

Lecturers and consultants in applied mathematics will be available throughout the 1982-83 academic year in programs sponsored by SIAM. The Visiting Lectureship Program is intended to promote a deeper understanding of applied mathematics in the

scientific community, particularly in colleges and universities. The Visiting Consultants Panel was organized to offer assistance in the development of applied mathematics programs at both the undergraduate and graduate levels.

For abstract form or brochure on the programs, write SIAM, 1405 Architects Building, 117 S. 17th St., Philadelphia, PA 19103.

SEX EQUITY IN MATHEMATICS: INSERVICE TRAINING INSTITUTES

by Carole B. Lacampagne and Claudia Za slavsky

Sex-related differences in the teaching and learning of mathematics, and in attitudes toward mathematics have long been recognized. In an attempt to overcome such differences, a project was developed to foster sex equity in mathematics education. On-site training was held during the 1981-82 academic year at two urban New York City sites and in the suburban communities of Ridgewood and Montclair, New Jersey. These thirty-hour inservice institutes were funded by the U.S. Department of Education under Title IV (1964 Civil Rights Act) and Title IX (Sex Equity), and sponsored through the Institute for Urban and Minority Education, Teachers College, Columbia University. The project had as its goals to:

- develop awareness of sex-related differences in the teaching and learning of mathematics, and in attitudes toward mathematics, and of the impact of these differences upon women;

- analyze the causes of such sex inequity in mathematics education and suggest effective strategies for overcoming these inequities;

- discuss and develop programs to encourage nondiscrimination on the part of school personnel and parents;

- provide resource materials to carry out these programs.

In New York City, the participants were primarily female elementary and junior high school teachers. New Jersey participants were more diversified, with nearly equal representation of male and female teachers, grades six through twelve.

Curricular areas covered by the New York City groups were the influence of the school, the home, and the media in socializing girls into stereotypically "feminine" roles, and the analysis of theories concerning physiological differences between boys and girls in learning mathematics. Other areas included math anxiety, problem solving, real world applications of mathematics, and examples of female mathematicians and scientists. Discussions of these areas led to consideration of other forms of inequity: sex inequity in fields other than mathematics, and inequity in mathematics education based on race and ethnic origin, a vital issue in a multi-ethnic city like New York.

The project Consultant/trainers found the needs of the urban participants somewhat different from those of the suburban participants. Thus, although the curricular areas were similar, the emphasis in the New Jersey institutes was on the teaching of mathematics: problem solving strategies via applications and recreational math, building spatial visualization skills, overcoming math anxiety, integrating the history of mathematics and mathematicians (especially female mathematicians) into the curriculum, and programs and media designed to enhance student (especially female student) awareness of the usefulness of mathematics to careers. Emphasis of these areas fosters mathematical growth in all students, but may have an especially high payoff for the female student in helping her overcome many of the traditional cultural myths associated with the learning of mathematics.

Participants were given a wealth of resource materials to share with their colleagues and to use in their classrooms. In addition, each participant was responsible for a final project designed to assess the patterns of mathematics course enrollment in the school by sex and by grade or alternatively to encourage positive attitudes in students and/or colleagues. To extend the impact of the institutes, the results of these projects were disseminated among participants' colleagues.

The institutes concluded with a conference at Columbia University where the participants and several invited guests evaluated the effectiveness of the project and discussed the outlook, unfortunately bleak, for funding of similar institutes. With federal money under the Women's Equity Act no longer available for pre-college projects, alternative methods for funding such institutes are a must.

Participant evaluation of the institutes was positive. Dr. Effie Bynum, Project Director, and Dr. Carole Lacampagne and Ms. Claudia Zaslavsky, Consultant/trainers for the institutes, are pleased with the results of the project and believe it can serve as a model for those planning similar pre- and inservice mathematics education courses. For more detailed information about the project, write Dr. Carole B. Lacampagne, Bergen Community College, Paramus, NJ 07652.

THE CLASSROOM CLIMATE: A CHILLY ONE FOR WOMEN?

by Roberta M. Hall with the assistance of Bernice R. Sandler
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The entire paper may be obtained for \$3.00 from the Project on the Status
and Education of Women, Association of American Colleges, 1818 R St., NW,
Washington, DC 20009.

Introduction

As greater numbers of women students enter the higher education system, the postsecondary community has become increasingly concerned about such issues as the continuing low enrollment of women in "traditionally masculine" fields,¹ the fact that women undergraduates feel less confident about their preparation for graduate school than men attending the same institution,² and the surprising decline in academic and career aspirations experienced by many women students during their college years.³ These concerns take on a new significance given current and projected enrollment patterns: although higher education has traditionally been associated with the educational and professional preparation of men, women students are the "new majority" of undergraduates. The education of women is literally central to the postsecondary enterprise.

However, despite women's gains in access to higher education--especially since the passage of Title IX--women undergraduate and graduate students may not enjoy full equality of educational opportunity on campus. Indeed, women's educational experiences may differ considerably from those of men, even when they attend the same institutions, share the same classrooms, and work with the same graduate advisors. The most extensive longitudinal study of student development conducted to date concludes that:

even though men and women are presumably exposed to common liberal arts curriculum and other educational programs during the undergraduate years, it would seem that these programs serve more to preserve, rather than to reduce, stereotypic differences between men and women in behavior, personality, aspirations and achievement.⁴ Many factors, including familial and social expectations, may contribute to the preservation of these differences. However, faculty behaviors which express different expectations for women than for men students, or which lead women to feel their academic and career ambitions are not as important as those of men students may play a major role in limiting women students' development.

Most faculty want to treat all students fairly and as individuals with particular talents and abilities. However, some faculty may overtly--or, more often, inadvertently--treat men and women students differently in the classroom and in related learning situations. Subtle biases in the way teachers behave toward students may seem so "normal" that the particular behaviors which express them often go unnoticed. Nevertheless, these patterns, by which women students are either singled out or ignored because of their sex, may leave women students feeling less confident than their male classmates about their abilities and their place in the college community.

The classroom climate

Many postsecondary institutions have evaluated their policies and practices toward women primarily in terms of legal issues and requirements. More recently, however, a number of colleges and universities have begun to recognize the importance of the institutional atmosphere, environment or climate--both within and outside the classroom --in fostering or impeding women students' full personal, academic and professional development.⁶ Indeed, as one study notes, "There is persuasive evidence that, in selecting and reacting to educational environments, females tend more than males to be attuned to the personal supportiveness of these environments."⁷

Institutions as diverse as Oberlin College, Hope College, the University of Wisconsin, the University of Delaware, Harvard University, Yale University, the University of California at Berkeley, and the institutions involved in The Brown Project (Barnard, Brown, Dartmouth, Princeton, SUNY at Stonybrook, and Wellesley)--to name but a few--have conducted surveys and other research to determine how adequately the institution as a whole meets the needs of its women students. Researchers are asking questions about how women are treated in the classroom, the laboratory, the undergraduate and graduate advising relationship, and in the less formal intellectual exchanges that occur with faculty and with other students.⁸ All of these contexts may affect how women students view themselves. They can encourage women's full intellectual development and academic and career aspirations, or dampen women's energies and ambitions.

Although many persons and experiences can help shape the campus climate, faculty attitudes and behaviors often have a profound effect--especially for women students.⁹ As Joseph Katz writes in Men and Women Learning Together: A Study of College Students in the late 1970's:

The newly raised consciousness of women students is in some respects fragile. In the intellectual and academic spheres there is still a tendency for women to think themselves as not quite on a par with men...there is some indication that women are meeting the challenge creatively, but they also could use more help from their teachers....¹⁰

In part because of the disproportionate number of male faculty at the college and university level, women may not always get this help.¹¹ Several studies indicate that men faculty tend to affirm students of their own sex more than students of the other sex, and often perceive women students primarily as sexual beings who are less capable and less serious than men students.¹² Although these attitudes may be changing, a host of behaviors which can convey such attitudes are still prevalent in the academic setting.

Both men and women faculty--even those who are most concerned about sex discrimination--may inadvertently communicate to their students limiting preconceptions about appropriate and expected behaviors, abilities, career directions and personal goals which are based on sex rather than on individual interest and ability. For instance, some professors may habitually use classroom examples in which the man is always "the professional," the woman always the "client" or "patient," thus making it more difficult for women to imagine themselves in professional roles.¹³ Men and women faculty alike may ask questions and then look at men students only--as if no women were expected to respond.¹⁴ Some faculty may tend to ask women "lower order" factual questions ("When did Wordsworth write the first version of The Prelude?") and reserve "higher order" critical questions for men¹⁵ ("What do you see as the major thematic differences between the 1805 and the 1850 versions?"). Others may make seemingly helpful comments which nevertheless imply that women in general are not as competent as men ("I know women have trouble with spatial concepts, but I'll be happy to give you extra help"). Some professors may be unaware that they interrupt women more often than men students, or allow women to be easily interrupted by others in class discussion.

In addition to subtle forms of discrimination in classroom interaction, more obvious behaviors can also create a chilling climate. These may include disparaging comments about women as a group and the use of sexist humor or demeaning sexual allusion (for example, a slide in an accounting class that features a bikini-clad woman "guaranteed to provide accurate measurements.")

Whether overt or subtle, differential treatment based on sex is far from innocuous. Its cumulative effects can be damaging not only to individual women and men students but also to the educational process itself.

Faculty behaviors: some new questions

Faculty, administrators, researchers and women students themselves⁵ are beginning to consider the importance of faculty behaviors in creating an institutional "climate" that fosters the full development of all students, and to ask questions such as the following:

- * Are women students less likely to be called upon directly than men students? Do faculty tend to ask women and men students the same kinds of questions? Do they encourage women as much as men to think for themselves?
- * Do women students receive as much informal feedback, encouragement or praise as men for their academic efforts?
- * Are women interrupted more often than men during class discussion? Can this lead women to feel that their views are not being listened to or taken as seriously as those of their male peers?
- * Do teachers tend to make more eye-contact with men when they ask a question of the class as a whole, thus "recognizing" men and inviting responses from them?
- * Do professors often assume that women students are uncertain about what they want to say (or perhaps, not saying much that is worthwhile) because women may tend to state their classroom comments hesitantly or in "overly polite" fashion?
- * Are some professors more likely to remember the names of the men students in their classes than those of the women?
- * Are teachers as likely to choose women as men for student assistants and to give them the same responsibilities?
- * Do some professors inadvertently discourage women from enrolling in traditional "masculine" majors or from the "harder" subspecialties?
- * Are graduate advisors more likely to contact men students when publication, research, and other professional opportunities arise? Does this make it more difficult for women than for men to see themselves as potential professionals and colleagues?
- * Do some professors use sexist humor to "spice up a dull subject" or make disparaging comments about women as a group? How does this affect women in the classroom?

RECOMMENDATIONS

Policy recommendations for administrators

- * Issue a policy statement which makes it clear that overtly biased comments, use of sexist humor, and related behavior on the part of faculty are not appropriate in the classroom or in related learning situations.
- * Incorporate the institutions's policy on classroom climate issues in statements about good teaching.
- * Determine how a concern with classroom climate can best be integrated into the mission, priorities and style of your institution.
- * Include information on classroom climate issues in workshops for all faculty, including teaching assistants.
- * Ensure that all new faculty are informed of institutional commitment to an equitable classroom climate.
- * Develop criteria about providing an equitable learning climate for women to be used in evaluating applicants for faculty and staff positions.
- * Include classroom climate issues as a factor in merit evaluations.
- * Develop a grievance procedure that can accommodate everyday inequities in classroom and related learning situations (nonactionable discrimination) as well as discrimination that is illegal.

General recommendations

- * Include classroom climate issues in student evaluations.

- * Hold informal meetings to discuss classroom climate and to stimulate awareness of the issues.
- * Set up a committee of women and men students to develop a questionnaire or survey geared to those climate issues of greatest concern on your campus.
- * Evaluate results of the survey, publicize where appropriate and develop plans for further activity.
- * Use a survey (by department) for men and women undergraduate and graduate students to evaluate classroom, departmental and institutional climate and to determine if women find the climate less congenial than men do.
- * Evaluate whether women transferring from "traditionally male" to "traditionally female" fields have done so because of an inhospitable classroom or departmental climate.
- * Form an information-sharing network with other institutions--both coeducational and single sex--that are evaluating their learning climate for women.
- * Use a new or already-established committee to evaluate classroom climate issues in the institution. Involve faculty, administrators, student affairs staff and students--including women and minority students, and representatives from all concerned student groups.
- * Hold meetings geared to male students (possibly led by male faculty and/or student affairs staff) to discuss male roles, attitudes, speaking styles, etc. in terms of their impact on the classroom climate.

Recommendations for presidents, deans and department chairs

- * Utilize the active support of respected faculty who share the objective of improving the learning climate for women.
- * Ask heads of units, either formally or informally, what they are doing/have done to ensure an equitable classroom climate.
- * Mention classroom climate in speeches to reinforce its importance as an institutional priority.
- * Circulate materials about classroom climate, such as this paper, to members of the academic community.
- * Discuss classroom climate informally at parties, luncheons, meetings, etc.
- * Sponsor workshops, seminars or other sessions on classroom climate.

Recommendations for student affairs personnel

- * Establish a workshop for all faculty who are academic advisors to increase their understanding of the classroom climate issues (as well as the traditional societal expectations and personal conflicts) that can limit women students' academic and career choices.
- * Familiarize residence hall advisors with aspects of the learning climate that can discourage women students, as well as with existing channels for seeking counseling, exploring grievance procedures, etc.
- * Collaborate with faculty on research concerning the learning climate for women at your institution.
- * Interview or survey women and men students to determine whether they perceive overt and/or subtle discrimination in their classes.
- * Hold workshops for faculty about classroom climate issues.
- * Indicate your availability to meet with individual faculty to discuss classroom climate issues.
- * Establish a procedure to get feedback from each department about current classroom climates, areas which need improvement, and departmental goals you can help to facilitate.
- * Work with staff of the continuing education or re-entry programs, minority center, etc. to plan workshops or group counseling sessions that focus on the climate problems special groups of women may face.

Recommendations for faculty development programs

- * Establish workshops, seminars or individual consultation sessions designed to help

faculty become aware of classroom issues. Emphasize activities which provide a personal frame of reference for data presented.

- * Aid faculty members in using audiotape, videotape and other devices to identify ways in which they may treat men and women students differently.
- * Encourage faculty to keep journals, student contact logs or other records to keep track of the frequency and nature of their interactions with women and men students.
- * Bring students and faculty together to discuss the climate of a given classroom.
- * Set up "micro-teaching" workshops to help faculty identify and change differential patterns of interaction with women and men students.
- * Help faculty identify ways in which they respond to differential interactions between men and women students in the classroom.
- * Train faculty to conduct classroom climate workshops, seminars, etc. for their colleagues and/or students.
- * Train interested faculty to be observers in colleagues' classes.

Publicizing classroom climate issues

- * Use the student newspaper and faculty newsletter or bulletin to help make students and faculty more aware of classroom climate issues.
- * Use the student newspaper to conduct a classroom climate survey.
- * Distribute an informational flyer on classroom climate issues which includes suggested actions and resource persons to contact.
- * Use campus media to combat "humor" with humor.

Promoting institutional research

- * Offer incentives, such as summer funding, release time, support personnel, etc. to encourage research and planning in improving the learning climate.
- * Establish awards for on-campus research in classroom climate issues.
- * Publish a catalogue of research on campus climate and related issues done by staff at your own institution.

Curriculum

- * Include in required introductory courses, where appropriate, a unit on sex/status differences in verbal and nonverbal behavior and the valuation of behaviors by sex.
- * Offer a speech/communications workshop in intellectual argumentation skills geared specifically to the difficulties some women (and men) students may experience regarding class participation.
- * Incorporate classroom climate issues in teacher-education programs and emphasize practical skill-building techniques designed to identify and overcome subtle differential treatment of students on the basis of sex.

Recommendations for faculty

Evaluating the classroom climate

- * Use whatever means are available (audiotape, videotape, a colleague, faculty or student development staff, or student observer, etc.) for observation of your own classes to determine whether you inadvertently treat women and men students differently.
- * Administer a survey to your students to determine whether women and men students find the climate of your classroom equally hospitable, and to measure men's and women's perception of sex-based differences in classroom interaction.
- * Where appropriate, devise assignments in which students learn research methods by collecting data concerning the classroom climate.

Avoiding behaviors that can create a cold climate for women

AVOID

- * Disparaging women in general, women's intellectual abilities, or women's professional potential.
- * using sexist humor as a classroom device.

- * making seemingly helpful comments which imply that women are not as competent as men.
- * turning a discussion of a women student's work toward a discussion of her physical attributes or appearance.
- * discussing women faculty in terms of their sex rather than their professional status.
- * grouping students according to sex in a way which implies that women are not as competent or do not have status equal to men.
- * disparaging scholarship on women, or ridiculing specific works because they deal with women's perceptions and feelings.
- * questioning or disparaging women students' seriousness of purpose and/or academic commitment.

creating a climate that can encourage women's full participation

In class:

- * Pay particular attention to classroom interaction patterns during the first few weeks of class, and make a special effort to draw women into discussion during that time.
- * Set aside a class session early in the semester for discussion of anxieties students might have about participating in class.
- * Tell your classes you expect both women and men students to participate in class discussion.
- * Make a specific effort to call directly on women as well as on men students.
- * In addressing the class, use terminology that includes both men and women in the group.
- * Respond to women and to men students in similar ways when they make comparable contributions to class discussion.
- * Notice whether the "feminine" or "masculine" style of a student's comment, question or response affects your own perception of its importance.
- * Intervene in communication patterns among students that may shut out women.
- * Note patterns of interruption to determine if women students are interrupted more than men--either by yourself or by other students.
- * Ask women and men qualitatively similar questions.
- * Give men and women students an equal amount of time to respond after asking a question.
- * Give women and men the same opportunity to ask for and receive detailed instructions about the requirements for an assignment.
- * Use parallel terminology when addressing women and men students in class, or referring to men and women in classroom examples.
- * When talking about occupations or professions in class discussion, use language that does not reinforce limited views of men's and women's roles and career choices.
- * Avoid using the generic "he" whenever possible.
- * Avoid placing professional women in a "special category".
- * Avoid reference to women students' appearance, family, etc., without similar reference to men students' appearance or family.
- * Experiment with language that reverses expectations based on sex.
- * Make eye contact with women as well as with men students after asking a question to invite a response.
- * Watch for and respond to nonverbal cues that indicate women students' readiness to participate in class.
- * Use the same tone in talking with women as with men students.
- * Ensure that women are not "squeezed out" by male classmates from viewing laboratory demonstrations or engaging in other group assignments.
- * Assume an attentive posture when responding to women's questions or listening to their comments.

Encouraging women outside the classroom:

- * Meet with women students to discuss academic and career goals.
- * Encourage women students to pursue traditionally "masculine" majors and subspecialties

- when these areas reflect the particular student's interests and abilities.
- * Consider women as well as men students when choosing classroom, teaching and research assistants.
 - * Ensure that women and men assistants have equally independent responsibility for their classes, and equal opportunities to pursue their own research.
 - * Make a special effort to consider women for teaching and research assistantships in traditionally "masculine" fields.
 - * Offer to write letters of recommendation for women students.
 - * Consider women as well as men students when making nominations for fellowships, awards and prizes.
 - * Include women graduate students in the "informal" interactions that can be important in communicating support and acceptance as a colleague.
 - * Provide women with informal as well as formal feedback on the quality of their work.

Recommendations for women students

- * Do an informal "tally" of patterns of interruption, successful introduction of topics, development of comments, etc. during a typical class session to see if they break down along sex lines.
- * If you seem to be disproportionately interrupted in a given class, discuss your perception with other women students to see if their experience coincides with your own.
- * Give credit or "authorship" to comments made by women classmates.
- * Give your professors positive feedback for efforts to create an equitable learning climate.
- * Familiarize yourself with your institution's grievance procedure for sexual harassment. If it does not include a mechanism for airing concerns and providing feedback to faculty about overtly biased comments and sexist humor in the classroom, work to have it changed.
- * Use your student evaluation form to comment--positively or negatively--on the climate of your classes.
- * Where appropriate, discuss problems of classroom climate with the department chair or dean.
- * Encourage student publications such as the school newspaper to write about the subject of classroom climate.
- * Hold meetings, workshops or hearings about classroom climate in order to bring about awareness of the subject.
- * Encourage student organizations to press for inclusion of classroom climate issues in faculty development programs and in official statements relating to teaching standards.
- * Recognize features of your own speaking and nonverbal style that may be counter-productive in a classroom setting.
- * If you feel you would benefit, modify your speaking style to enhance your effectiveness in the classroom.
- * Hold meeting or workshops on class participation anxiety.

Recommendations for special groups of women students

- * If you find your department's climate unsupportive, seek out professional organizations for women in your field.
- * Encourage the organization of a support group comprised of women students majoring in your area.
- * Establish an organization for graduate women, older women, minority women, etc. where problems concerning lack of support and other climate issues, can be aired and strategies devised to deal with them.
- * If your campus has a minority student center, alert staff to classroom climate issues that may affect minority women.

Recommendations for professional associations and organizations

- * Include sessions on classroom climate issues at your annual meeting.
- * Identify sub-groups within your organization that might be especially appropriate for considering classroom climate issues.
- * Work with other organizations and associations.
- * Stimulate research on issues related to classroom climate by calling for papers for presentation and/or publication.
- * Offer awards for innovative ideas in faculty/student development that focus on classroom climate issues.

NOTES

1. Mary Lou Randour, Georgia Strasburg and Jean Lipman-Blumen, "Women in Higher Education, Trends in Enrollments and Degrees Earned," in the Harvard Education Review Vol. 52, No. 1, 1982.
2. Elaine H. El-Khawas, "Differences in Academic Development During College," Men and Women Learning Together: A Study of College Students in the Late 70's, Office of the Provost, Brown University, April 1980, pp. 7-8. (Subsequently cited as Report of the Brown Project.)
3. Alexander W. Astin, Four Critical Years: Effects of College on Beliefs, Attitudes and Knowledge, Jossey-Bass Publishers, San Francisco, CA, 1977, pp. 114, 129. More recent studies suggest that this trend may have moderated somewhat, but is still evident. See, for example, El-Khawas, Report of The Brown Project, p. 23.
4. Ibid., p. 216.
5. See, for example, Student Needs Survey: A Report, compiled by Suzanne Howard for the Women Students' Leadership Training Project, National Student Educational Fund, Washington, DC, March 1980.
6. Women's colleges have been concerned with the impact of overall institutional climate and the role of faculty supportiveness in creating such a climate for some time. See, for example, A Study of the Learning Environments at Women's Colleges, the Women's College Coalition, Washington, DC, Spring 1981, which surveyed women's college faculty and presidents concerning their perceptions of institutional mission, curricular content, academic and career counseling, etc., as directed to the particular needs of women students (such as self-confidence, leadership skills, and preparation for new roles).
7. James C. Hearn and Susan Olzak, "The Role of College Major Departments in the Reproduction of Sexual Inequality," pre-publication draft, pp. 6-7. For further information, contact James C. Hearn, The American College Testing Program, P.O. Box 767, Iowa City, IA 52243.
8. Much of this research appears in the Report of the Brown Project and in papers presented at the Research Conference on Educational Environments and the Undergraduate Woman, Center for Research on Women and Project HERS, Wellesley College, September 1979.
9. See, for example, El-Khawas, p. 19, and Hearn & Olzak, p. 17.
10. "The New and Old Lives of Men and Women Undergraduates," Report of the Brown Project, p. 157.
11. Lois Monteiro, "The College Academic Environment: Student-Faculty Interaction," Report of the Brown Project, pp. 43-59.
12. See, A.R. Hochschild, "Inside the Clockwork of Male Careers," in Women and the Power to Change, ed. Florence Howe, McGraw Hill Book Co., New York, 1975; M.E. Tidball, "Of Men and Research: The Dominant Themes in American Higher Education Include Neither Teaching Nor Women," Journal of Higher Education, Vol. 47, No. 4, 1976, pp. 373-89; and I.M. Heyman, Women Students at Berkeley: Views and Data on Possible Sex Discrimination in Academic Programs, University of California, Berkeley, June 1977 as cited in Jeanne J. Speizer, "Role Models, Mentors and Sponsors: the Elusive Concepts," Signs, Vol. 6, No. 4, Summer 1981, p. 698.
13. This and other types of classroom examples which may reinforce stereotypes and discourage women students are discussed at length in Judith M. Gappa and Janice Pearce, Sex and Gender in the Social Sciences: Reassessing the Introductory Course, 3 vols., which brings together guidelines for changes in course content in psychology, sociology,

and microeconomics, with recommendations for changes in faculty-student communication patterns.

14. See, Barrie Thorne, "Claiming Verbal Space: Women Speech and Language in College Classrooms," paper presented at the Research Conference on Educational Environments and the Undergraduate Woman, Wellesley College, September, 1979, p. 15.

15. For discussion of this pattern at the elementary school level, see Myra P. Sadker and David M. Sadker, Sex Equity Handbook for Schools, Longman, Inc., New York, 1982, pp. 104-5.

OF POSSIBLE INTEREST

Books by, about, and for women: The University of Georgia Press, Athens, GA 30602.

Canadian feminist scholarship: Black Rose Books, 3981 Boulevard St.-Laurent, 4th Floor, Montreal, Quebec, Canada H2W 1Y5.

The Turning Point is a program guide for directors of women's re-entry programs and displaced homemaker programs. The Turning Point includes materials (readings and exercises) for eight workshops: Support Systems, Stress Management, Assertiveness, Legal Concerns, Financial Planning, Self-assessment, Career Exploration, and Conducting the Job Hunt. Each workshop section is introduced with leader instructions in presenting the material, and each includes an extensive recommended resource and reading list. The publication was prepared by the staff of The Turning Point, the program for Displaced Homemakers at the Adult Life Resource Center, University of Kansas. Write: Adult Life Resource Center, Division of Continuing Education, Continuing Education Building, The University of Kansas, Lawrence, KS 66045.

The Fifth Annual Convention of NWSA (National Women's Studies Association) will be held June 26-30, 1983, at The Ohio State University, Columbus, Ohio. The theme of the Convention reflects NWSA's continuing commitment to the enrichment of feminist education at all educational levels and in every educational setting. The Convention is designed to facilitate creative exchange of ideas on feminist teaching, research, and community services. The emphasis at this Convention will be on the relationship between quality and equality, furthering our conviction that a quality education depends upon equal access for women and girls to all educational opportunities. Write: Marlene Longenecker/Elaine Pugh, Conference Coordinators, Center for Women's Studies, The Ohio State University, 207 Dulles Hall, 230 West 17th Avenue, Columbus, Ohio 43210.

AWM Table at Denver Meeting, January 5 - 9, 1983

As the President said in her President's Report in this issue, it is very important that the AWM Table be staffed at mathematics meetings. The Table is closed during AWM activities; the Table should be staffed at all other hours that AMS-MAA registration is open. Please check your schedule with the program in the AMS Notices and see if you will be free to staff the Table at least one hour during the meetings. Let Rebecca Struik, Department of Mathematics, University of Colorado, Boulder, CO 80309, know when you can do so. She is in charge of the Table at the Denver meetings and will appreciate any help you can give.

Bettye Anne Case, Chair
AWM Meetings Arrangements

NOETHER LECTURE

Cathleen S. Morawetz will deliver the fourth Emmy Noether lecture at 3:30, Thursday, January 6. The title of her talk will be "How do perturbations of the wave equation behave?"

Abstract

Perturbing the wave equation in free space by adding a reflecting body, a simple potential, a changing sound speed or a non-linear term affects behavior of the solutions. Much has been determined by analysis but especially for non-linear perturbations new phenomena arise and open new mathematical questions. This talk will survey some of the old results and the new questions.

DEADLINES: Nov. 24 for Jan.-Feb., Jan. 24 for Mar.-Apr., Mar. 24 for May-June
AD DEADLINES: Dec. 6 for Jan.-Feb., Feb. 4 for Mar.-Apr., Apr. 5 for May-June
ADDRESSES: Send all material except ads to Anne Leggett, Math. Dept., Western Illinois University, Macomb, IL 61455. Send everything else, including ads, to AWM, Women's Research Center, Room 204, Wellesley College, 828 Washington St., Wellesley, MA 02181.

Job Ads

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

University of Alabama, Birmingham. Mathematics Dept., Birmingham, AL 35294 (1) Professorship (tenure-track) for teaching & research in applied mathematics. Dept. members are currently active in nonlinear wave dynamics, mathematical modeling & operations research. Summer teaching is optional & normally available at 1/3 of academic salary. Send (by Jan. 31, 1983) application, resume & 3 letters of reference to Dr. J. Buckley, Math Dept. (2) Tenure-track position for fall, 1983. Required: established record of quality research & ability to enhance research efforts of Dept. Dept. members are active in algebra, applied mathematics, ordinary & partial differential equations & point set topology. Rank of Asst. Prof., Assoc. Prof. or Prof. depending on qualifications & experience. Salary negotiable. Send application, vita & 3 letters of reference to Prof. Louis Dale, Math Dept.

University of Alabama, Huntsville. Dept. of Mathematics. One or more tenure-track positions beginning 9/1/83. Rank & salary commensurate with experience & credentials. Required: excellent research ability & a specialty area of numerical analysis, differential equations (ordinary or partial), mathematical modeling, or optimization. Funded research experience desirable. Send application, (by Feb. 1, 1983) vita & 3 letters of reference to F.L.Cook, Chmn., Dept. of Math, Univ of AL, Huntsville, AL 35899.

California State University, Long Beach. Dept. of Mathematics, 1250 Bellflower Blvd., Long Beach, CA 90840. (1) Tenure-track positions, rank open, fall, 1983. Required: Ph.D in Computer Science or Mathematics & specialization in Comp. Sci. or computational mathematics especially numerical analysis & analysis of algorithms; evidence of excellence in teaching & strong potential for research. Duties include teaching, conducting research leading to publication & serving on committees. Salary \$19,932-\$36,540 depending upon qualifications. Before 12/1/82 send resume, 3 letters of reference & transcripts to Dr. Gittleman, Chmn. (2) Several lectureships (2-year appt, non tenure-track) Fall 83. Ph.D. in Math, excellence in teaching & potential for research required. Salary \$19,044-\$22,896/academic year. By 2/15/83 send resume, 3 letters of reference & transcripts to Dr. Gittleman, Chmn. Numerous part-time positions requiring at least an M.A. in math are also available with first preference given to those applying before 5/15/83.

San Diego State University. Dept. of Mathematical Sciences, San Diego, CA 92182-0314. (1) Tenurable position in applied mathematics, Fall, 1983. Required: Ph.D. in math or closely related field; experience & interest in mathematical modeling & expertise in some area of applied math, e.g. mathematical economics, mathematical biology, graph theory, mathematical physics, information theory, coding theory, artificial intelligence, simulation or differential equations. Duties include guiding student teams through industrial research projects. Must be committed to quality teaching & research competence in applied mathematics. By 1/15/83 send vita & 3 references to Applied Mathematics Search Committee. (2) Two tenurable Computer Science positions, Fall, 1983. Rank: open. Salary (depending on rank): from \$20,868 to \$36,540. Required: Ph.D., research background & good teaching references. Duties: teaching undergraduate & graduate courses in computer software & theory, directing research at master's level & conducting own research. By 1/15/83 send vitae & 3 references to Comp. Sci. Search Committee. (3) Tenurable position in Statistics. Rank: open. Salary: \$20,873 to \$36,544. Required: Ph.D. with strong commitment to teaching undergraduate & graduate students & strong interest in biostatistics. Duties: consulting, directing masters level projects & conducting own research. By 12/15/82 send vitae & 3 references to Statistics Search Committee. (4) Two-year postdoctoral lectureship Sept., 1983. Prefer recent Ph.D. in pure or applied math. Moderate teaching duties & some classroom experience desirable. Salary: \$19,044 to \$22,868; some cost of living increase is expected. Send vita & 3 references to Postdoctoral Search Committee by 1/15/83.

Stanford University. Dept. of Mathematics, Stanford, CA 94305. Robert Osserman, Chmn. (1) Two asst. professorships Fall 1983, for mathematicians with strong interest & ability in teaching & research. Send resume & have 3 letters of reference sent. An evaluation of your teaching should be included in a separate letter. (2) One or two senior appts. of mathematicians outstanding in research & teaching, preferably in analysis or the area from analysis to differential geometry. Applications should include curriculum vitae & bibliography.

University of California, Berkeley. Dept. of Mathematics, Berkeley, CA 94720. S. Smale, Vice Chairman for Faculty Appointments. (1) Tenure-track position Fall, 1983, rank to be determined by qualifications in areas of algebra, analysis, applied math, foundations or geometry. Required: demonstrated substantial achievement in research and teaching. By 12/15/82 send curriculum vitae, list of publications, a few selected reprints & names of 3 referees. (2) Tenure-track Asst. Professorship in areas of algebra, analysis, applied math, foundations or geometry. Required: demonstrated potential in research & teaching. By 12/15/82 send curriculum vitae,

University of California, Berkeley (con'd)

list of publications, a few selected reprints & names of 3 referees. (3) Several 2-year lectureships Sept., 1983 for new & recent Ph.D's of any age in areas of algebra, analysis, applied math, foundations or geometry. By 1/31/83 send resume, reprints, preprints and/or thesis abstract. Ask 3 people to send letters of recommendation.

Metropolitan State College. Dept. of Mathematical Sciences, Box 38, 1006 11th Street, Denver, CO 80204. R. D. Whittekin, Chmn. Three positions for fall, 1983. Required: Ph.D. in math or closely related fields & evidence of effective teaching. Teaching load 12 hours per semester. Three year probationary period required before regular faculty status granted. Application & resume due 1/24/83, and 3 reference letters and transcripts due 2/14/83.

Wesleyan University. Dept. of Mathematics, Middletown, CT 06457. Anthony W. Hager, Head. Junior tenure-track position in Comp. Sci. Fall, 1983. Area of specialization is completely open & teaching responsibilities are two courses per semester. Wesleyan's central computing system operates a DECSYSTEM-2060. By 2/15/83 send vita & 3 letters of recommendation to Head.

University of New Haven. Dept. of Mathematics, 300 Orange Ave., West Haven, CT 06516. Dr. W. T. Whitley, Chmn. Full-time position depending on funding Sept., 1983. Required: Ph.D. in math with background in comp. sci, demonstrated teaching excellence, research ability & interdisciplinary interests. Teaching load 24 credit hours per academic year. Salary & rank dependent on qualifications. Submit vita, transcripts & at least 3 letters of reference by 1/25/83.

University of Florida. Mathematics Department, Gainesville, FL 32611. Three tenure-track Asst. Professorships 8/1983. Of particular interest are applicants with following research specialities: numerical analysis, partial differential equations, linear algebra, probability & stochastic processes. Salary: \$20,000 - \$27,000 per academic year. Send resume, list of publications & have 3 letters of reference sent to Mark L. Teply, Chmn., Search & Screen Committee.

University of Florida. Dept. of Statistics, Gainesville, FL 32611. (1) Asst. in Statistics, 8/1983. Non-tenure accruing but continuing position. Duties: full time teaching of statistics undergraduate service courses to students in social sciences, engineering, or computer science. Possible research opportunities. Required: Masters or Ph.D. with at least masters level training in statistics. Teaching experience desirable. By 2/4/83 send vita, graduate transcripts & 3 letters to D.D.Wackerly, Dept. of Stat. (2) Tenure-track Asst. Professorship Fall, 1983. Required: strong interest in teaching & research. Applicants with research interest in Time Series & Stochastic Processes are especially encouraged to apply. By 1/31/83 send resume, transcripts, reprints & have 3 letters of reference sent to John G. Saw, Dept. of Statistics, 505 NSC, Univ of FL, Gainesville, FL 32611.

Emory University. Dept. of Math & Comp. Sci., Atlanta, GA 30322. Trevor Evans, Search Committee. Position of Chairperson. University is committed to the development of a strong department & candidates should have outstanding research record & dedication to excellence in teaching. Appt. will be at rank of Professor with tenure. Applications will be considered beginning in November, 1982.

University of Illinois, Chicago. Dept. of Mathematics, Statistics & Computer Science, Box 4348, Chicago, IL 60680. Possible positions. Must have excellent research record & ability to direct graduate students. Salary & rank commensurate with qualifications; preference given to applicants with postdoctoral experience seeking tenure-track position. Send resume & have 3 letters of reference sent to Louise Hay, Head.

Purdue University. Dept. of Mathematics, West Lafayette, IN 47907. M.S. Baouendi, Head. (1) Several regular or research asst. professorships 8/1983. Required: exceptional research promise & excellence in teaching. By 1/15/83 send resume & 3 letters of recommendation. (2) One or two Prof/Assoc. Professorships with tenure in applied math for academic year 83-84. Required: Excellent research credentials. Early applications & nominations are solicited. (3) Possible Assoc. Prof/Professorship 8/1983. Excellent research credentials required. Send resume & 3 letters of recommendation.

Northern Illinois University. Dept. of Mathematical Sciences, DeKalb, IL 60115. D. B. McAlister, Chmn. Two Asst Prof/Assoc. Prof/Professorships, Fall 1983 in applied math. Must have proven record of research & commitment to teaching. Preferred fields: numerical analysis, mathematical software, & applied math including mathematical modelling & optimization. By 12/1/82 (or until positions have been filled) send application, vitae & names of 3 referees.

University of Iowa. Dept. of Mathematics, Iowa City, IA 52242. Robert H. Oehmke, Chmn. Visiting & tenure-track openings for 1982-83. Special attention will be given to persons in numerical analysis or p.d.e. By 1/24/83 send vita & 3 letters of recommendation.

University of Louisville. Dept. of Mathematics, Louisville, KY 40292. Dr. John A. Roberts, Chmn., Search Committee. Tenure-track position, Fall 1983. Required: Ph.D. in math or related area, active research program, evidence of good teaching ability & strong interest in teaching advanced undergraduate probability & statistics courses. By 1/2/83 send application, graduate transcripts & at least 3 letters of recommendation.

Goucher College. Dept. of Mathematics & Computer Science, Towson, MD 21204. Dr. Robert Lewand, Chmn. Three Asst. Professorships Fall, 1983. Duties: teaching undergraduates both math & comp. sci. Average load: 9-11 hours per week. Salary: From \$20,000 depending on experience. Send vita, transcripts of graduate work & 3 letters of recommendation.

U. S. Naval Academy. Dept. of Mathematics, Annapolis, MD 21402. F. I. Davis, Chmn. Three year tenure-track Asst. Professorships, Fall 1983. Initial 10 mo. salary \$20,000 - \$27,000 commensurate with experience & qualifications. Research opportunities exist for augmenting salary during summer intersessional period. Specialization in applied math desired but not essential. Required: Ph.D., commitment to excellence in teaching & ability to pursue independent research. Send resume, transcripts & 3 letters of recommendation to Chmn.

University of Maryland. Dept. of Mathematics, College Park, MD 20742. Prof. John Osborn, Chmn. Possible tenure or tenure-track positions 8/1983. Rank & salary dependent on qualifications. Exceptionally strong research program necessary. By 1/15/83 send vita, description of current research & 3 letters of recommendation.

Brandeis University. Dept. of Mathematics, Waltham, MA 02254. (1) Three 3-year Asst. Professorships in pure mathematics Sept., 1983. Teaching load six hours per week. Required: Ph.D. & demonstrated excellence in teaching & research. (2) Three 1-year visiting positions in pure mathematics; 1 at a senior level & 2 at a junior level Sept., 1983. Teaching load six hours per week. For all positions send curriculum vitae & letters of recommendation by 1/15/83.

Michigan Technical University. Dept. of Mathematical & Computer Sciences, Houghton, MI 49931. Dr. Richard Millman, Head. Several tenure-track positions in applicable mathematics (e.g. probability, fluid mechanics, ODE, POE, etc.) statistics, differential geometry, operations research, numerical analysis and computer science. Also several visiting positions. Required: excellent research & teaching. To apply, write Dr. Millman, Head.

Wayne State University. Dept. of Mathematics, Detroit, MI 48202. B.J. Eisenstadt, Chmn. Several tenure-track positions Fall, 1983. Ph.D. required. Excellence in research & teaching expected. Send application, detailed resume & names of 3 academic references.

University of Michigan. Dept. of Mathematics, Ann Arbor, MI 48109. Prof. F.W. Gehring, Chmn. (1) Hope to have tenure or tenure-track position in one or more of following areas: applied math, numerical analysis, combinatorics, Lie theory, differential geometry & analysis, Fall, 1983. Salary & rank dependent on qualifications. Preference given to applications completed by 2/1/83. (2) One T. H. Hildebrandt Research Asst. Professorship. Three year appt. Fall, 1983. Reduced teaching load. Preference will be given to persons of any age having Ph.D. less than 2 years & to those with applications completed by 1/1/83. Salary: at least \$22,000 for academic year plus possible additional in summer.

College of Saint Catherine. Dept. of Math Sciences, Saint Paul, MN 55105. Suzanne Molnar, Chairperson. Asst. Professorship of Math/Comp. Sci. (tenure-track) Sept., 1983. Required: Ph.D. in math with strong background in comp. sci. or M.S. (Ph.D. preferable) in comp. sci. with strong background in math. Excellence in teaching essential. Teaching load 6 courses per year. Send resume & have 3 letters of recommendation sent by 1/2/83.

Mankato State University. Dept. of Mathematics, Astronomy & Statistics, Mankato, MN 56001. Dr. C. D. Alders, Chmn. Tenure-track Asst. Professorship beginning either Jan. 83 or Sept. 83. Ph.D. required. Prefer applicants in numerical analysis or applied math. Research interests must be compatible with needs of Dept. Closing date for applications for Jan. 1983 employment is 12/1/82. Closing date for applications for Sept. 1983 employment is 2/15/83. Send vita, research interests & 3 letters of recommendation.

University of Minnesota, Duluth. Dept. of Mathematical Sciences, Duluth, MN 55812. Sabra Anderson, Head. Two tenure-track Asst. Professor Computer Science positions 9/1/83. to teach 6 to 8 hours per week and conduct Comp. Sci. & mathematical research in an active department with diverse interests. Competitive salary. Qualifications: Ph.D. or ABD in Comp. Sci. or closely related area plus significant Comp. Sci. experience. By 3/1/83 send vita, transcripts & 3 letters of recommendation to Head.

University of Minnesota. School of Mathematics, Minneapolis, MN 55455. Willard Miller, Head. Several visiting positions from lecturer to full professor available for periods of one quarter to two years. Required: strong research & teaching abilities. Prefer applicants whose research interests are compatible with those of School. Apply by 12/27/82.

Russell Sage College, Women's Division. Dept. of Mathematical Sciences, Troy, N.Y. 12180. Dr. Rita Murray, Chairwoman. Tenure-track Asst. Professorship, Fall, 1983. Prefer applicants with evidence of outstanding teaching. Course load includes undergraduate courses in math as well as service courses in comp. sci. Salary depends on qualifications. Send resume & references by 2/1/83.

SUNY - Buffalo. Dept. of Mathematics, Buffalo, N.Y. 14214. (1) George William Hill/Emmy Noether Research Instructorship for 1983-84. Prefer recent or prospective Ph.D.'s whose degrees will be completed by 9/1/83, appt. being for 2 years. Ten mo. stipend is \$22,000 plus generous staff benefits. Will teach 2 one-semester courses during 10 months. When 2 year appt ends, consideration for 2 year appt as asst. prof. will be given. Each applicant should prepare sketch of his or her post-high school educational background & research activity. Field: Pure or applied mathematics. (2) Asst. Professorship for term starting 9/1/83. Salary competitive. Will consider outstanding applicants in all fields; prefer those in discrete applied math. (3) Asst. or Assoc. Professorship for term starting 9/1/83. Salary competitive. Will consider outstanding applicants in all fields; prefer those in algebraic or differential topology & applied math (including combinatorics). By 12/15/82 send application, supporting information & have 4 letters of recommendation sent to Dr. Zbigniew Zielezny, Search Comm. Chmn., Dept. of Math, SUNY-Buffalo, 106 Diefendorf Hall, Buffalo, N.Y. 14214.

Syracuse University. Dept. of Mathematics, Syracuse, N.Y. 13210. Prof. L.J.Lardy, Chmn. Tenure-track Asst. Professorship. Research potential is of primary importance. Required: Ph.D. with specialization in numerical analysis or closely related field with sufficient graduate study to teach courses in the area. By 2/15/83 send detailed vita, transcript & 3 letters of reference.

Union College. Dept. of Mathematics, Schenectady, N.Y. 12308. Theodore A. Bick, Chmn. One-year leave replacement for undergraduate teaching. Ph.D. & good teaching record required; research interest in category theory or set theory desired; other research interests considered. Salary in Asst. Prof. range depending on qualifications. Please contact T. A. Bick, Chmn.

East Carolina University. Dept. of Mathematics, Greenville, N.C. 27834. Prof. Eugene E. Ryan, Chair, Search Committee. Search reopened for position of Chairperson. By 12/1/82 submit dossier with 3 letters of reference.

North Carolina State University. Dept. of Statistics, Raleigh, N.C. 27650-5457. Dr. H. R. van der Vaart, Biomathematics Search Committee. Asst/Assoc. Professorship for Biomathematics Program. Teaching, research, consulting in field of stochastic modeling/model validation. By 1/31/83 send resume, research interests, transcripts (recent graduates) & 3 reference letters.

University of North Carolina. Mathematics Dept., Chapel Hill, N.C. 27514. University Distinguished Professorship. We are especially interested in candidates with interests in the area of partial differential equations, but will consider those in all fields of mathematics. An established record of excellence in research, demonstrated commitment to teaching & the ability to provide scientific leadership are required. Send application, vita & names of at least 3 references to Chmn.

Ohio State University. Dept. of Mathematics, 231 W. 18th Ave., Columbus, OH 43210. Prof. Alan Woods, Head. (1) Research instructor for 1983/84. Required: Ph.D. & strong research promise. Position renewable up to 2 additional years. Send credentials and have letters of recommendation sent to Head. (2) Several positions at all ranks from instructor to full professor, Fall, 1983. Prefer candidates in areas of applied & pure mathematics. Significant research accomplishments & promise & evidence of good teaching ability will be expected of successful applicants for tenure-track positions. By 1/15/83 send credentials & have letters of recommendation sent to Head.

University of Cincinnati. Dept. of Mathematical Sciences, Mail #25, Cincinnati, OH 45221. One or more Asst. Professorship(s) (tenure track), Fall 83. Required: Ph.D. with vigorous commitment to research & teaching. Prefer applicants trained in mathematical & applied statistics, but will consider those in other fields. Send vita & 3 letters of recommendation to Faculty Search Committee.

University of Pennsylvania. Dept. of Mathematics E 1, Philadelphia, PA 19104. Prof. Jerry L. Kazdan, Chmn., Personnel Committee. Some tenure positions 1983-84 or 1984-85. Department's principal strengths & interests lie in fields of algebra, analysis, category theory, combinatorics, and geometry-topology. Candidates in these areas are invited to apply now. Salary will depend on experience. Contact Chmn.

University of Texas at San Antonio. Division of Math, Computer Science & Systems Design, San Antonio, TX 78285. Prof. Stanley G. Wayment, Director. Several tenure-track asst./assoc. professorships Sept., 1983. Required: Ph.D. & an interest in teaching & research. Applicants in mathematics, statistics, computer science, systems design, or mathematics education will be considered. Send vitas to Prof. Wayment.

University of Utah. Dept. of Mathematics, Salt Lake City, UT 84112. (1) Three or four non-renewable instructorships. Persons of any age receiving Ph.D's in 1982 or 1983 are eligible. Applicants will be chosen on basis of ability & potential in teaching & research. Duties: teaching 2 courses through academic year. Salary: around \$21,500. (2) One visiting position of one year or less. Selection will depend on teaching ability & potential contribution to our research environment. (3) One or two senior level positions. Depends on availability of funds, research expertise & teaching ability. By 2/1/83 send vita, bibliography & 3 references to Committee on Staffing.

University of Wisconsin, La Crosse. Mathematics Department, La Crosse, WI 54601. Dr. David W. Bange, Chmn. Tenure-track position Spring, 1983. Required: Ph.D. in mathematics or statistics & strong commitment to excellence in undergraduate teaching. By 11/15/82 send resume, transcripts & 3 letters of reference to Chmn.

University of Wyoming. Dept. of Mathematics, Laramie, WY 82071. Prof. Kenneth I. Gross, Head. Two tenure-track positions in applied mathematics. Emphasis on energy-related research, interaction with the scientific & engineering communities, and leadership within the Math Dept. Excellent research opportunities. Rank & salary commensurate with qualifications. Apply to Head.

York University. Dept. of Mathematics, N 520 Ross Bldg., Downsview (in Toronto), Ont M3J 1P3 Canada. P. Olin, Chmn. Several tenure-track Asst/Assoc Professorships, July 1, 1983. Also several limited term sabbatical replacement positions of one, two or three years duration. Special consideration given to applicants in applied statistics & operations research. Applicants should have proven ability & potential for research & teaching. Send applications with detailed curriculum vitae & have 3 letters of recommendation sent to Chmn. In accordance with Canadian Immigration requirements, this ad is directed to Canadian citizens & permanent residents of Canada.

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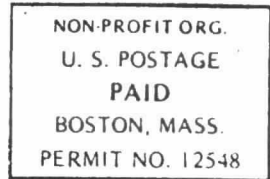
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November-December, 1982



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The Speakers' Bureau has proved to be one of the best ways to improve the visibility of women in Mathematics. We are currently seeking additional participants for the new edition of our booklet. To be included, you need only complete the following form and return it to the AWM office.

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	HS	High school	Gen	General audience (P.T.A., etc.)
	JHS	Junior high school	F	Flexible (tailored to fit audience)

I am interested in being a member of the arrangements committee.