File

Association for Women in Mathematics

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DUES! DUES! DUES! DUES! If you have not paid your dues by February 5, 1979, you will be dropped from the mailing list. Send your dues to the
NEW AWM OFFICE ADDRESS: AWM
Women's Research Center, Room 204
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828 Washington Street
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PRESIDENT'S REPORT

Biloxi meeting. The AWM is sponsoring a panel at the joint mathematics meetings on Saturday, January 27 at 4 p.m. The title of the panel is: the ERA and the mathematical community. Speakers include Mary Gray, Chandler Davis, J. R. Quine, and (possibly) Judy Green. I will be moderating. There will also be an AWM table at the meetings, and everyone who will be at Biloxi is invited to come by, and also to volunteer some time to sit at the table.

Ordinarily the foregoing paragraph would end with "hope to see you there." But Mississippi is a non-ERA state and as an organization we support the pro-ERA boycott of states which have voted down the ERA. This is why officially we are not meeting in Biloxi, simply sponsoring a panel, and why there are no AWM council, business, or executive committee meetings in Biloxi. If you are boycotting the Biloxi meeting because of the ERA, you are urged to write to the AMS and the MAA telling them so, and also to the Biloxi Chamber of Commerce. If you are present at the meeting but find its location politically unfortunate, join us in wearing the green armbands we will be handing out at the AWM table.

By-laws. The AWM by-laws were drawn up hastily many years ago by a lawyer in order to get us incorporated as soon as possible. There have always been gaps between our organizational structure and what our by-laws say it is. So a committee has been formed consisting of Judy Green, AWM vice president; Judy Wason, AWM treasurer; and myself to rewrite the by-laws. We hope to have our suggestions written up by the Biloxi meeting so that our draft can be informally circulated and discussed. Our schedule is to have a revised draft in the March newsletter, which will be presented to the AWM meeting in August, 1979 in Duluth. The document surviving that meeting will then be presented to our full membership, together with a mail ballot, sometime in the Fall of 1979.

Spring elections. This spring we will elect a vice president, a treasurer, a newsletter editor, and at-large executive committee members. Nominations are hereby solicited for these offices. Names of nominees are needed by early January. A ballot and brief statements by the nominees will be published in the March newsletter.

Judy Roitman
Department of Mathematics
University of Kansas
Lawrence, KS 66045

REVIEW OF SHEILA TOBIAS' OVERCOMING MATH ANXIETY

by Judy Roitman

Sheila Tobias was associate provost of Wesleyan University when she became actively concerned about math education, especially for girls and women. Now she appears as a spokesperson on tv shows, writes articles for mass circulation magazines, and conducts training seminars around the country. She has just written this book, for a popular as well as a professional audience. I wish I could praise it, but the fact is that I see it as actually counterproductive to her purpose, which is to get more people to study more mathematics.

The first problem with the book is that Tobias, not a mathematician, does not understand mathematics (as she herself admits). Her mathematics is often confusing, and often wrong. She is attached to misleading pictures, and does not want them taken away in the name of accuracy. For a good summary of this, see Gina Bari Kolata's review of October 23 in the Washington Post.

The book's other problems are more subtle and more serious.

The tone is that it is somehow normal to be anxious about mathematics and unable to do it. This is confusion of vocabulary. What is common is not necessarily normal. Witness the fact that slavery has often been common practice, yet none of us would say that slavery is a normal human condition. It may be common for people to avoid mathematics; it may be even more common for women to avoid mathematics; but these behaviors are not therefore normal. The tone of Tobias' book runs counter to her goal. If mathematicians and math teachers are another species, why bother trying to learn math?

Tobias claims that the enemy is math anxiety, a sort of mental disease which must be cured by essentially psychoanalytic techniques. Yet her chapter on the nature of math anxiety could just have easily have been called a chapter on the nature of math avoidance. She nowhere establishes that it is anxiety which causes avoidance; after all, nearly every professional mathematician has moments of severe anxiety related to his or her mathematical work. Adherence to the anxiety model can lead the student and teacher to emphasize negative feelings. The student is seen as crippled, possibly paralyzed. This view pervades Tobias' book, e.g. she constantly refers to "the math disabled." There may be people who are so traumatized that only deep psychological counselling can get them into a math course, but for the majority of people this emphasis only reinforces the stereotype of mathematics as weird and inhuman.

Finally, Tobias gives the unmistakable impression that math anxiety is predominantly a woman's disease. She tries not to say this, she says she is not saying this, but the impression is there, even in the blurbs on the book jacket. She understands that this emphasis is perceived as counterproductive, and tries to answer her critics. But her answer doesn't work, for the same reason that her discussion of hormones and mathematics fails emphatically to refute those who claim women are constitutionally unable to do mathematics. She simply does not quote the evidence, which is the large number of women who either are mathematicians or do math related work. Nowhere is there the sense that it is natural for a woman to do good mathematics, or to use sophisticated mathematics in her career. Even though she mentions some highly qualfied women mathematicians, it is primarily as teachers of mathematics, with their mathematical expertise unemphasized. The community of women scientists is not a presence in this book, and the reader has no way of knowing it exists. Again and again the worst stereotypes of female inadequacy are reinforced.

THE BAKKE CASE: IMPLICATIONS FOR WOMEN IN EDUCATION

paper prepared for the Project on the Status and Education of Women, Association of American Colleges, 1818 R. Street, NW, Wash., DC 20009 and the American Association of University Women, AAUW, 2401 Virginia Ave., NW, Wash., DC 20037

Consistent with its long standing practice of avoiding constitutional decisions when it can decide on the basis of a statute, the Supreme Court decided the Bakke case not in terms of the Fourteenth Amendment but in terms of Title VI of the Civil Rights Act of 1964 which prohibits discrimination in federally assisted programs on the basis of race, color and national origin. The opinion of the Court, written by Justice Powell, therefore did not directly address the constitutional questions of quotas and affirmative action.

While sharply divided on the issues involved, the Supreme Court ruled that:
*strict numerical quotas on the basis of race are illegal in admissions programs, and
*race may be considered as one factor in admissions programs.

BAKKE AND STUDENT ISSUES

Admissions Quotas for Women

Although the Court prohibited strict racial quotas in admissions programs, it made no reference to admissions quotas based on sex. However, Title IX of the Education Amendments of 1972 already prohibits such numerical quotas in admission to federally assisted vocational schools, public undergraduate institutions, and all graduate schools. Private undergraduate institutions (including single sex schools) are exempt from the admissions requirements of Title IX. The Bakke decision does not prohibit these schools from having admissions quotas on the basis of sex.

Taking Sex Into Account as a Factor in Admissions

Although it allowed race to be taken into account as one factor in admissions, the Court made no reference to sex as a permissible criterion. Justice Powell noted that:

> Gender-based distinctions are less likely to create the analytical and practical problems present in preferential programs premised on racial or ethnic criteria. With respect to gender there are only two possible classifications. The incidence of the burdens imposed by preferential classifications is clear. There are no rival groups who can claim that they too are entitled to preferential treatment. Classwide questions as to the group suffering previous injury and groups which can be burdened are relatively manageable for reviewing courts.

It is unclear whether Justice Powell meant that sex could also be taken into account in admissions in some way. However, Justice Powell also stated that the "attainment of a diverse student body" is "clearly a constitutionally permissible goal for an institution of higher education." Sex presumably could be one of the factors in attaining a diverse student body. Additionally, in previous decisions concerning non-educational cases, the Court has allowed sex to be taken into account. The issue of how race and sex may or may not be taken into account in admissions programs is likely to give rise to further litigation.

Voluntary Affirmative Action and Quotas in Student Programs Other Than Admissions

The Court did not deal with other kinds of affirmative action for students. It seems likely that student affirmative action programs (such as special programs to help older women return to school) are not affected by the Bakke decision. Under Title IX such programs are allowed.

Preference on the basis of race and possibly sex may be allowed in some instances. Shortly after the Bakke decision, the Supreme Court set aside a Circuit Court judgement which had invalidated quotas required by the student government at the University of North Carolina. The student constitution required the student body president to appoint two blacks and two females to the campus legislature if they were not elected. Additionally, a student appearing before the campus disciplinary court could request that four of the seven judges be members of his or her race and sex. The Circuit Court had ruled that these provisions were racially discriminatory and violated the Fourteenth Amendment and other civil rights laws. No mention was made of the sex discrimination provisions. In vacating this judgement, the High Court asked the Circuit Court to reconsider its decision of the Bakke case.

Remedial Action for Students

The Court did not strike down preferences based on race as a remedy "for constitutional or statutory violations resulting in identified, race-based injuries to individuals held entitled to the preference." Under Title IX, remedial action (including preference) may be ordered by HEW or the courts as a remedy for sex bias.

BAKKE AND EMPLOYMENT ISSUES

The Bakke decision was limited to admissions in higher education. The exact implications--if any--for employment are not readily apparent. What follows is a brief summary of what is permissible under current statutes and court decisions.

Voluntary Affirmative Action

Employers may still undertake voluntary affirmative action programs provided they do not give preference on the basis of race, color, religion, national origin or sex. Such actions may include a self-evaluation of policies and practices, a written plan, active recruiting of women and minorities, and development of goals and timetables.

Affirmative Action and the Federal Contract Compliance Program

Under Executive Order 11246, institutions which voluntarily accept a federal contract must develop an affirmative action plan that includes numerical goals in order to do business with the government. Preference on the basis of race, color, religion, national origin and sex is prohibited by the Executive Order. Goals are not mandatory quotas. There is no penalty for not meeting a goal. Employers are required to make a good faith effort. The Bakke decision did not abolish goals or timetables.

Affirmative Action and Title VII

Title VII of the Civil Rights Act of 1964 prohibits preference in employment on the basis of race, color, religion, national origin and sex. Most employment cases involving strict numerical ratios or quotas as a remedy have arisen under Title VII. In cases where there has been a finding of discrimination, courts have sometimes required employers to hire a specific number of women and/or minorities for a limited period of time, such as the coming year, or until "x" percent of women or minorities is reached. Justice Powell stated:

> The courts of appeals have fashioned various types of racial preferences as remedies for constitutional or statutory violations...Such preferences also have been upheld where a legislative or administrative body charged with the responsibility made determinations of discrimination by the industries affected, and fashioned remedies deemed appropriate to rectify the discrimination...But we have never approved preferential classifications in the absence of proven constitutional or statutory violations.

In line with above, the Supreme Court refused to review a case involving the Equal Employment Opportunity Commission and American Telephone and Telegraph Co. A few days after the Bakke opinion the Court thus left standing a decision which gave preference to women and minorities as a remedy for past discrimination. Although the Court's action does not have the impact it would have if it had affirmed or favorably reviewed the case, refusal to review the case suggests that the Court might approve such remedies. Until the Court rules directly, the issue remains unresolved.

The Fourteenth Amendment and Women

Although the Bakke case was not decided on constitutional grounds, Justice Powell's language concerning women and the Fourteenth Amendment is instructive. The Fourteenth Amendment guarantees equal protection of the laws. Classification by race is traditionally viewed by the Court as "suspect" or inherently discriminatory under the Fourteenth Amendment. Justice Powell reiterated this premise in his statement:

> "When a classification denies an individual opportunities or benefits enjoyed by others solely because of his race or ethnic background, it must be regarded as suspect."

Earlier in the decision, Justice Powell stated that "...the Court has never viewed such classification [by sex] as inherently suspect or as comparable to racial or ethnic classifications for the purpose of equal protection analysis." Thus the Bakke decision makes it clear that the Court does not extend the same equal protection of the laws to women as it does to racial and ethnic groups.

In summary, the Bakke case did not resolve all of the many issues confronting institutions and affirmative action.

AWM COUNCILMEMBER STATEMENTS

Name: Louise Hay
Address: Math Dept., UICC, Box 4348, Chicago, IL 60680
Affiliation: Univ. of Illinois at Chicago Circle
Position: Professor
Statement: The position of women in mathematics seems to be improving somewhat (at least we're much more visible!)--but clearly lots still remains to be done.

ERA AND PROFESSIONAL MEETINGS

by Anne Leggett, editor

Kenneth E. Boulding, President-elect of the American Association for the Advancement of Science, Distinguished Professor of Economics at the University of Colorado at Boulder, and a director of the Institute of Behavioral Science, has written an article called "The Ethic of Science and the E.R.A." for the Technology Review, the M.I.T. alumni journal, Aug./Sept. 1978 issue. Peter J. Gollum, Fermilab, has written a letter to the editor of Physics and Society, the newsletter of the Forum on Physics and Society, on the Equal Rights Amendment and the APS (American Physical Society). This letter appeared in the July, 1978, issue. These men give opposing answers to the question of whether or not professsional societies should participate in the ERA boycott by cancelling and rescheduling meetings already scheduled for non-ERA states and by refusing to schedule future meetings in these states.

Boulding's argument is a step backward for the AAAS. He disagrees with the decision of the Board of the AAAS to move its 1979 annual meeting from Chicago to Houston. As an economist, he bases his argument on a "cost-benefit" analysis. He states that he is a firm supporter of equal status for men and women. However, he feels that passage of the ERA would probably not accomplish this objective. "The genetic differences between men and women are large. Equality is not the same as identity. Differences do not imply either superiority or inferiority, domination or submission. In the face of such very complex differences, equaltiy of status has to be worked out by a very complex process involving love and affection, respect and benevolence, as well as bargaining, contracts, and legal rights. The concept of rights is an empty one in the absence of the specification of duties, for the right of one person must always be interpreted in terms of the duties of another. Trying to specify rights without specifying duties is likely to be empty and may even discourage the duties which we are trying to encourage."

On the other hand, he feels that the cost to the scientific community of participation in the ERA boycott, especially the cancellation of already-scheduled meetings, would be very high. "It is essential to the ethic of science that people should be persuaded by evidence and not by threats. ...Science has advanced human knowledge so spectacularly precisely because it abandoned threat as a means of changing people's opinions. ...That there might be occasions in which the scientific community would have to resort to whatever threat power it might have in order to prevent a dangerously adverse social change or in order to counter a threat to the scientific community itself is certainly a reasonable proposition. ...The use of threat without any attempt at persuasion, argument, or the presentation of evidence, which the professional and scientific associations seems to be doing in regard to the Equal Rights Amendment, seems to me utterly foreign to the

whole spirit and ethic of the scientific enterprise and can hardly fail to do harm not only to the scientific community itself but to the very objectives which it is intended to foster."

His conclusion, then, is that the move of the AAAS annual meeting was inspired by just anger, but not by wisdom. My gut reaction to his argument is that he has written a very smooth but insidious piece. "The use of threat without any attempt at persuasion, argument, or the presentation of evidence"...just what does he think the Women's movement has been doing for the last few years? I prefer to believe that the scientific community has been listening to the persuasion, the arguments, the evidence for the need for an ERA. That the scientific community, as a supposedly super-rational body of Americans, ought to be supporting the call for passage of the ERA. Thinking over some recent letters in the NOTICES, I realize that I may be giving the mathematical community, at least, a little too much credit for rational thought. But how a social issue which affects half the human race can be shoved aside as too political, not scientific enough is beyond me.

It is not clear to me what Boulding's discussion of "rights" and "duties" means. Since he doesn't state what he believes the respective duties of men and of women to be, I may be overly suspicious, but this "genetic differences" stuff sounds too much like it's leading to "woman's place is in the home". What "duties" are we trying to "encourage", anyway? And does the existence of genetic differences necessarily mean that duties must be sex-specific? I know some men who make better mothers in the classical sense than their wives do. "Respect and benevolence"...respect, okay, but who is going to be benevolent to whom and about what? I don't need any more pats on the head, man, I really don't.

Gollum's letter is excellent counterpoint to Boulding. He takes it as given that future meetings should not be scheduled in non-ERA states. Also, he argues that meetings already so scheduled should be cancelled or rescheduled. First he explains why he feels that the APS ought to take a position on the ERA. "The historical pattern of discrimination against women in education, employment, and other areas impedes the careers of women in physics, discourages many other talented women from entering the field, and retards the Society's goals of 'the advancement and diffusion of the knowledge of physics.' The ERA is an attempt to remove many of the sex-discriminatory practices which have hampered, and continue to hamper, women in their careers. As such, it deals with a problem affecting the Society's members and goals, and is therefore a legitimate topic for consideration by the Society." Secondly, it is clear that the APS position to the ERA must be "yes."

Thirdly, he maintains that refusal to meet in unratified states is an appropriate tactic. "What could be more just, or more educational than for us to withhold our money from those areas of the country which would deny economic equality to their fellow citizens?" Again we see a cost-benefit analysis. But since we start with different premises, the conclusion is somewhat different. Cancelling an already scheduled meeting has an immediate effect, and it's a pocketbook effect. Some scientific organizations have already rescheduled large meetings, so this is possible. And "risk from legal liability is small compared to the losses to the physics community resulting from sex-discrimination." So the cost to the APS of cancelling and rescheduling is seen as small when compared to the benefits to society as a whole.

FIFTH ANNUAL REPORT OF EMPLOYMENT OF WOMEN IN MATHEMATICS DEPARTMENTS

by Judy Green, AWM vice-president

The first report of the 22nd Annual American Mathematical Society survey of faculty salaries appears on pages 390-394 of the October 1978 AMS NOTICES. In that report the total number of faculty as well as of women faculty at various ranks and types of institutions are given for the years 1977-78 and 1978-79. As in the first four AWM reports we use this information to compute the percentages of women in these categories.

For the second time we also separate out non-tenured doctorate-holding instructors and assistant professors in order to see how the women who have recently earned Ph.D.'s are doing. Since instructorships are usually held for two years and assistant professorships for five or six years we note that in the past two years 13.3% of the US doctorates

were earned by women while for the past five and six years the figures are 11.3% and 11.0% respectively. We also refer you to page 397 of the same October 1978 NOTICES for comments by Wendell Fleming on the sex, race, and citizenship of new doctorates. These comments end with the statement that "among the 50 individuals shown ... as not yet employed 9 are women." This contrasts with 13.3% of the new US and Canadian Ph.D.'s being earned by women.

Since the percentages of women with Ph.D.'s began growing a number of years ago we looked to see whether an increase had yet shown up in the percentage of women with doctorates who had tenure at the associate or full professor rank. No such increase occurred in the four-year colleges and universities taken as a whole - the figure stays at 4.4% - and most types of institutions showed changes of at most 0.2%. However an increase from 6.3% to 6.8% occurred at masters granting institutions while a decrease from 8.9% to 8.0% occurred at bachelor granting institutions.

The subdivisions of the doctorate granting institutions used in the survey are:

I. the 27 most prestigious mathematics departments in the US
II. the 38 next most prestigious mathematics departments in the US
III. the rest of the US mathematics departments
IV. statistics, biostatistics, and biometric departments in the US
V. other US mathematical sciences departments
VI. Canadian departments

		percentage of women on faculty		percentage of women on tenured faculty	
		1977-78	1978-79	1977-78	1978-79
Doctorate granting					
I	without doctorate	50.0	66.7	-	-
	with doctorate	4.0	4.5	2.7	2.7
	total	4.2	4.7	2.7	2.7
II	without doctorate	37.0	45.8	16.7	16.7
	with doctorate	4.2	4.5	3.3	3.1
	total	5.0	5.4	3.5	3.3
III	without doctorate	30.8	33.7	28.0	28.9
	with doctorate	5.4	5.2	3.1	3.2
	total	8.4	8.2	5.8	5.8
combined I,II,III					
	without doctorate	31.8	35.3	27.2	28.0
	with doctorate	4.7	4.9	3.0	3.0
	total	6.4	6.6	4.4	4.3
IV	without doctorate	19.0	19.6	10.0	10.5
	with doctorate	8.5	8.1	4.4	4.4
	total	9.2	8.6	4.7	4.7
V	without doctorate	8.3	8.7	0	0
	with doctorate	4.2	4.3	2.4	2.3
	total	4.4	4.5	2.3	2.2
VI	without doctorate	18.9	19.3	18.6	21.4
	with doctorate	4.1	3.7	2.7	2.9
	total	5.7	5.4	4.3	4.7
Masters granting					
	without doctorate	26.9	26.3	20.3	19.7
	with doctorate	7.4	8.0	6.8	7.1
	total	12.8	12.8	10.4	10.3

Bachelor granting				
without doctorate	24.1	23.6	15.2	16.2
with doctorate	10.8	10.5	8.9	8.2
total	15.5	14.7	11.1	10.9
Four-year colleges and universities				
without doctorate	25.9	25.8	19.1	19.4
with doctorate	6.5	6.6	4.8	4.8
total	9.9	9.9	7.2	7.1

Non-tenured doctorate holding instructors and assistant professors

		1977-78			1978-79		
		total number	no. of women	percentage of women	total number	number of women	percentage of women
Doctorate granting							
I	instructors	63	6	9.5	59	6	10.2
	asst. profs.	149	13	8.7	154	19	12.3
	total	212	19	9.0	213	25	11.7
II	instructors	65	7	10.8	60	6	10.0
	asst. profs.	226	13	5.8	222	19	8.6
	total	291	20	6.9	282	25	8.9
III	instructors	62	13	21.0	57	8	14.0
	asst. profs.	353	39	11.0	355	41	11.5
	total	415	52	12.5	412	49	11.9
combined I,II,III							
	instructors	190	26	13.7	176	20	11.4
	asst. profs.	728	65	8.9	731	79	10.8
	total	918	91	9.9	907	99	10.9
IV	instructors	6	2	33.3	4	0	0
	asst. profs.	141	25	17.7	151	26	17.2
	total	147	27	18.4	155	26	16.8
V	instructors	1	1	100	2	1	50.0
	asst. profs.	146	11	7.5	142	11	7.7
	total	147	12	8.1	144	12	8.3
VI	instructors	5	2	40.0	4	1	25.0
	asst. profs.	65	4	6.2	59	4	6.8
	total	70	6	8.6	63	5	7.9
Masters granting							
	instructors	17	3	17.6	21	5	23.8
	asst. profs.	394	39	9.9	414	49	11.8
	total	411	42	10.2	435	54	12.4
Bachelor granting							
	instructors	19	3	15.8	12	2	16.7
	asst. profs.	364	56	15.4	379	54	14.2
	total	383	59	15.4	391	56	14.3
Four-year colleges and universities							
	instructors	238	37	15.5	219	29	13.2
	asst. profs.	1838	200	10.9	1876	223	11.9
	total	2076	237	11.4	2095	252	12.0

WOMEN AND MATHEMATICS IN INDIA

by Nirmala Prakash, Indraprastha College, Delhi, India
August, 1978

Thank you for inviting me to address the forum of Women Mathematicians in the forthcoming meeting of the ICM at Helsinki. Unfortunately, I will not be able to attend the meeting. However, I would like to share my thoughts with the members through this letter. I would like to begin by mentioning (you may not believe me, though, in the absence of authentic statistical evidenct) that the total number of Indian women graduating annually in Mathematics these days is larger than their counterpart in Europe and in America.

I do not blame you for disbelieving me, since the illiteracy rate in developing countries and the continuing lack of skilled labour are often cited as prime hurdles to economic development. In the case of India, however, of the students graduating from high schools, a very large percentage go to college. For a country like India, a mainly agricultural economy of 650 million, it is a large section of the population that takes time off to go to school.

Especially in urban areas, both small and large, there is an even distribution of male and female students and of financial aid to schools for girls and boys. The product thus depends on the nature of the educational system and the personal charisma of the teacher. Unfortunately, however, the equal opportunity afforded by the government is offset by the family which expects a greater contribution to household chores from girls than from boys. This acts as a distraction from their academic duties.

Low tuition, the availability of seats in a ever-growing number of colleges, and the social value of a B.A. all become important in enabling a student and especially a girl to embark on a college education.

Of course, I must remind you that the education system in India is a legacy of the British. It was established to meet the functional requirements of a bureaucracy run by the British, and it functions with little change to this day. The choice between the Physical Sciences and Art (Humanities) is made at the very young age of thirteen or fourteen. Mathematics is the only pure Science subject that is available both to Science and to Arts students, it being compulsory for the Science but not for the Art students. Only the best among the latter category opt for Math since it provides them with a competitive edge over others.

Furthermore, the inflexibility of our educational system prevents the student from switching from one field to another without securing readmission and competing with the incoming students. The choice of subjects at the college level thus seals the fate of entering students and their opportunities later on.

Medicine has an aura of respectability and of implicit social mobility for the ambitious. It signifies progressiveness amongst women and has been traditionally accepted by society. Engineering and Architecture are relatively male-dominated professions.

An entering student thus has two main considerations in mind: (a) the immediate possibilities opened up by his or her marks/academic performance, (b) the existing and potential job opportunities that become available through a certain specialization, viz Physics, Chemistry, Mathematics, History, Economics, Literature, Psychology, etc.

In the past, capable female students opted for Science or Arts for reasons mentioned earlier and at the college level, in order to maintain their excellent performance, chose to do Mathematics. Mathematics, because of the peculiar nature of its content, does not require excellent facility with the language. Even children with poor economic backgrounds but with a penchant for numbers and exacting mathematical logic have been consistently undeterred by their lack of literary aptitude. What is initially regarded as a winning option amongst students becomes of increasing interest and a serious alternative source of income. Until recently Mathematics, both pure and applied, offered only the teaching profession as a source of livelihood. Thus many good male students are drawn to applied sciences or to other Arts subjects that might make them more rounded individuals and improve their changes for the managerial and administrative cadres.

The higher secondary system of education and evaluation thus inadvertantly brings out latent mathematical skills despite a chronic shortage of teachers in some parts of the country and the awe that mathematical learning inspires.

Girls tend to exercise their options in limited directions due to unwritten sanctions of society and their own limited information about the opportunity costs of one area vs. another. Mathematics offers the opportunity for continued academic excellence, university-wide recognition and thus better chances for any scholarships. Girls who did Arts in school have fewer options and Mathematics, even today, remains a very attractive subject. Amongst those who choose Mathematics, girls as a group have better credentials than boys. Their ability is reflected in records that women students have set over the years. However, such academic excellence does not have equivalent material rewards for men and women. While only the very best of women mathematicians are selected for the limited openings in colleges, the same is not true for men.

The remainder of the graduating class must either teach in high schools or confine their activities to research on Government dole. The insecurity that the latter generates keeps men away from this area; for women, though, teaching has its own lure by way of providing more leisure, if nothing else.

The working woman in India, whether married or unmarried, has to shoulder domestic responsibilities which men effectively avoid. Of course, this does not go into any kind of social accounting since there is no method to account materially for such time spent. The profitability of contribution to the domestic half of existence has not been calculated by social scientists, since it is incompatible with the traditional rewards to labour and productivity. Despite all these pressures, women do function academically though promotions are few and far between.

Teaching positions in India are jobs which ensure a constant stream of income without the pressure of continuous performance in order to deserve promotion. Seniority is usually the basis for promotion.

Colleges are affiliated with a university. All B.A.-level classes are held in colleges, and only some M.A.-level classes are held in the university. While the number of students in colleges is decreasing as a fraction of the total number, the absolute number of female students has increased over the years. The reason is that increasing numbers of students prefer to be coeds.

This leads me to my next related statement. Insofar as the attraction of any field is dependent on the number of jobs eventually available, Mathematics, because of jobs in all-female colleges, will continue to attract/inspire a minimum number of women students. This accounts for the large number of women mathematicians as a percentage of the total. It also explains why the even distribution of jobs for male and female college teachers cannot be cited as a cause for discrimination.

As soon as we move beyond the college to the university, the representation of women in Mathematics becomes very weak. In fact, I know of no Indian women mathematicians (statistics excluded) of professorial rank. Can we argue that none of those active in research are qualified for a university position? The answer is, of course, no. For no sooner do we adopt a more subjective procedure of selection without any quotas for women or minorities than the male-dominated domain assumes an adversary position towards a female applicant. In the light of such programmed social considerations the subjugation of women becomes an accepted natural way of life. A lone female protestor demanding her rights becomes a pariah within her own community.

The educational system that generates such mathematical talent through its evaluation system where every examinee is a mere toll number and ensures opportunities through a quota system, fails when it comes to maintaining the subjective judgment of an all-male selection committee.

Needless to say, subtle ploys are deployed to keep women from decision-making positions. It must be said that women enjoy equal pay for every job they perform, but as we have seen, this is more of a myth than a reality.

As a final note, let me add that women all over the world must work effectively and conscientiously for achieving their rights in the academic world. Hopefully the year 1982 will find us close to our objectives.

FRENCH WOMEN IN MATHEMATICAL RESEARCH

by Pierre Samuel, Université de Paris-Sud, Orsay, France
August, 1978; written for AWM session at the ICM

It has sometimes been noticed that the situation of women mathematicians looked somewhat better in France than in many other countries. Having been in charge, from 1962 to 1969, of the mathematics section at the École Normale Supérieure de Jeunes Filles - the most important center for the formation of women mathematicians -, I will try to find the reasons for such a situation and to give my guesses about its evolution.

Apart from a very small number of exceptions, French universities depend from the State. Their staffs are formed of public servants, and the rules of the French public service exclude (in theory) any sexual discrimination: provided that they have the needed degrees (or successfully passed the required competitive examinations), men and women may freely apply for public service jobs. Of course, sexual discrimination sometimes exists in the committees which choose among the applicants, but already old examples (like Madame Curie) make mentioning the sex of a candidate to be in very bad taste: more devious reasons have to be invented in order to eliminate good candidates of the female sex.

Several French women mathematicians say, and this may be true, that the existence of the École Normale Supérieure de Jeunes Filles - "separate but equal" institution -, has helped their careers. This school is parallel to the famous École Normale Supérieure (Rue d'Ulm), and, since 1945, their official statuses are exactly the same. One is for women, the other one for men. The entrance depends upon a competitive examination at the level of the second year of the university; problems and subjects are the same for the two schools, but the examination committees are distinct. These competitive examinations are quite stiff.

At the Écoles Normales Supérieures, the curriculae are the same: complete the university studies, attend special courses and conferences (even seminars) introducing various subjects in mathematics, prepare for a competitive examination (called Agrégation) opening the most exalted jobs in high-school teaching, and (for the ones who are tempted by research) begin what we call a "Thèse de Troisième Cycle".

Two other "Écoles Normales Supérieures", very similar to the preceding ones but said to be not quite so good, are also parallel: Fontenay for Women, Saint Clous for men.

Between the two World Wars, the École Normale Supérieure de Jeunes Filles (then located in the suburb of Savres, whence the name "sevriennes" still used for a student or an alumna of this school) did not have the same status as the Rue d'Ulm school: it prepared only for high-school teaching, not for research. At that time, the most gifted young women could be admitted (after the competitive examination, of course) to the Rue d'Ulm school; this was the case for Ms. Jacotin-Dubreil, Ms. Lévy-Schwartz, and Ms. Ferrand-Lelong (who married classmates!).

Several "sevriennes" have said to me that they are happier with the new "separate but equal" status. In fact, the fashion among the Rue d'Ulm students is to be (or to look) very quick, very learned, very assertive, and most of the young women did not feel comfortable in such an atmosphere. When I was in charge of the "sevriennes", I very rarely convinced some of them to attend interesting courses or seminars given at the Rue d'Ulm school, in spite of the gentle-person agreement that any mathematical activity organized in one of the schools is open to the students of the other one. The "sevriennes" insisted upon having many activities organized in their own school. They were right: when a few young men from the other school came to attend some of these activities, something had been changed.

Another factor may have some relevance for evaluating the situation of women mathematicians in France: the endogamic custom of intermarriages. At least until very recently, much more than half of the women mathematicians at the "Maître de Conférences" level (= assistant professor in the US system) or above were married to male mathematicians with the same kind of jobs. No anti-nepotism rule exists in France, so that, whenever possible, an effort is made to give jobs in the same university (or in the same city) to couples of mathematicians. When this is not possible, one member of the couple has to commute; then, roughly speaking, the family is matrilocal when the two cities have the same level of attractiveness; but when one of them (very often Paris!) is strictly more

attractive than the other one, residence is in the more attractive city and, since men reach more easily than women the most interesting positions, the family is usually patriotical in that case.

In a few cases, women mathematicians at the "Maître de Conférences" level or above are married to non-academic men (e.g. engineers, agronomers...). Finding jobs in the city seems then more difficult. Under the pretext that she has fewer hours to spend on the place of her job than her husband, the woman is then usually forced to commute.

Apart from a few spinsters, unmarried women mathematicians have long been few and far between. But recently (women's lib. influence?), the number of young women mathematicians - unmarried or divorced - leading an independent life has increased.

A result of the intermarriage custom is that the women mathematicians are usually known by the influential members of the French mathematical community. Thus serious reasons (e.g., lack of competence, presence of an obviously more brilliant male candidate) have to be given for barring a woman from a job. This may act as a brake to sexism. On the other hand, "affirmative actions" of the US type are unknown in France: the official rule is to choose the "best mathematician", (whatever it may mean), regardless of sex, and a powerful nationwide control-system is there to enforce this rule.

Let us now deal with a third and very important factor: the evolution of the job situation. If my memory is not mistaken, there were no women mathematicians in French universities before the Second World War. But, during that war, some jobs became free, at least temporarily, their holders either being prisoners of war, or fighting in the Free French forces, or having taken refuge overseas. In that way (I think), Ms. Jacotin-Dubreil and Ms. Ferrand-Lelong began their careers; just after the war, tenured jobs were opened for them.

This period saw the end of the steady-state situation which characterized the mathematical jobs in the French universities. Their number began increasing, slowly until 1955, more and more rapidly afterwards until about 1969. This was the "golden age" for French mathematicians of both sexes. The greatest part of this growth has been concentrated in a quite small number of years, say 1961-1969, so that we had in mathematics a well-known phenomenon: whenever many people are needed in a given activity (be they mathematicians, industrial workers, teachers, doctors, or even warriors), society does not fail to call upon its women.

As a result, according to data collected in 1973 by Ms. Poirrier-Vigue (Seminaire "Mathématiques, Mathématiciens et Société", mimeographed at Orsay, 1974; alas, out of print), 12% of the professors and "maîtres de conférences" in French mathematics were women, a higher percentage than in most other western countries, topped only by Israel (23.4%) and by Australia (17.9%). But Ms. Poirrier-Vigue had some other very interesting findings:

- the percentage of women is much smaller in large departments than in small ones (roughly speaking, women are proportionally more numerous in departments in which mathematical life is less interesting);
- the number of doctor-degrees obtained by women peaked between 1964 and 1970, and then decreased rapidly;
- the percentage of women is much higher in the lower-rank jobs (27%) than in the upper-rank ones (12%);
- as soon as the "limits to growth" were reached (around 1970), most of the "sevriennes" had trouble finding university or research jobs and reverted to going into high-school teaching, whereas almost all (male) graduates of the Rue d'Ulm school were still able to go into university or research jobs.

Since 1973, the situation has become worse. Very brilliant young women still find interesting jobs, e.g. Renée Elkik at Orsay and Marie-France Vigneras at the Ecole Normale Supérieure de Jeunes Filles. But for most young women - and for many men also - the situation is bleak. Also women seem more easily discouraged than men: for a single "maître de conférences" job at Orsay, there are only three women among 34 candidates in May 1978; even more, the situation is similar in lesser places like Saint Quentin, with 4 women among 40 candidates.

Can one, however, conclude that, at least for the women in the right age bracket, the short period of quick growth (1962-1969) has been favourable? It is not obvious. Almost as many women obtained good university jobs during the preceding period of slow

growth (1950-1961). I am tempted to say that quick growth, leading inevitably to an abrupt ending, has been bad for many mathematicians, and particularly for women, who, for a variety of well-known reasons, are still the most vulnerable ones. A slower and more sustainable growth would have been much better. But here, maybe, the environmentalist is taking over.

MAA BROCHURES OF INTEREST TO AWM: part 2 of 2

by Henry L. Alder, President, MAA

The math in high school ... you'll need for college

The Committee recommended to the Board of Governors at its meeting on August 25, 1976, in Toronto that "the MAA should cooperate with NCTM on publication of a brochure similar to those issued by UCLA and the University of Wisconsin listing the amount and type of mathematics needed in high school for a great variety of college programs".

It is interesting to note that this recommendation resulted from a suggestion made by a high school teacher at one of the meetings held by the Committee in the Santa Clara Valley.

This recommendation was adopted by the Board, and such a brochure was prepared by the MAA Committee on Advisement and Personnel in cooperation with NCTM during the fall and winter of 1976. A copy of this Brochure, entitled THE MATH IN HIGH SCHOOL YOU'LL NEED FOR COLLEGE, together with a covering letter has been sent to all members of the MAA. In addition, a copy of this brochure has been sent to all high school guidance counselors together with a covering letter over the signatures of the Presidents of the MAA and the NCTM.

The response to this pamphlet and these mailings has been overwhelmingly favorable. The Washington office of the MAA and I have received a large volume of mail expressing appreciation for the publication of the pamphlet. A typical comment is the one received from Dr. Lucy W. Sells, Executive Specialist for Minorities and Women, The American Sociological Association, Washington, D. C.:

"...The Math in High School flier provides incredibly powerful leverage with political decision makers at local, state, and Federal levels. It looks as though the momentum is strong enough to keep that going after I leave this office on September 1.

"Thank you for your contribution, particularly in reaching the guidance counselors."

The eight page brochure prominently displays a list of fields that need more than two years of high school mathematics, such as Agriculture, Architecture, Biology, Business, Dental Hygiene, Economics, etc. Then it lists, for a great variety of fields, the number of years of high school mathematics universities typically require to enter the field. For example, it lists for Agricultural Economics 3 years, for Engineering 4 years, for Social Welfare 2 years. In addition it explains what 2 years of high school mathematics means by listing the topics to be included in these 2 years, and similarly for 3 and 4 years of high school mathematics.

The brochure also gives helpful advice such as: "Plan to take math in your senior year. Then it will be fresh in your mind when you are getting started in college."

On the recommendation of AWM Councilmember Ruth Rebekka Struik, the MAA Committee on Advisement and Personnel at its meeting on August 8, 1978, voted to add the following at the next reprinting of the brochure:

"It is particularly important if you are a woman to keep your options open by taking enough math courses. Women are now entering many careers which were formerly closed to them. Years from now you may be glad you took those extra math courses."

The brochure has been reprinted in many publications, for example, in the September 1977 issue of Computers and People where it appears as the centerfold.

The demand for the brochure continues to be very strong. In some areas of the country, for example, in California, it will be distributed this fall to all junior high school students.

Recommendations for the preparation of high school students for college mathematics courses

The Committee also recommended to the Board of Governors and the Board of Directors of NCTM approval of a document, now called RECOMMENDATIONS FOR THE PREPARATION OF HIGH SCHOOL STUDENTS FOR COLLEGE MATHEMATICS COURSES. This document, after some revision by both the Board of Governors of the MAA and the NCTM Board of Directors, was unanimously approved by both these Boards in September 1977.

A copy of this document has been sent to every member of the MAA. It has appeared in the December 1977 Newsletter of NCTM, in the April 1978 MAA Monthly (pp.228-231), and the June 1978 Two-Year College Mathematics Journal (pp.172-175). It has been disseminated to the NCTM affiliate groups with the recommendation by the then President John Egsgard that the document be considered as a topic of discussion at a regular meeting. It has been disseminated to the MAA Sections with my recommendation that the document be considered as a topic of discussion at a Section meeting. It has been sent to all high school guidance counselors with a covering letter over the signatures of the Presidents of NCTM and MAA. It has also been publicized in many other ways too numerous to list here.

The document has received strong endorsement from many groups and individuals and has been reprinted in many publications. Of particular interest is the pamphlet Guideline for Improving SAT Scores, published in April 1978 by the National Association of Secondary School Principals (NASSP). This pamphlet reports on 34 high schools in which SAT scores have remained stable or even risen during the period from 1966 to 1973. The NASSP requested the principals of these schools to give their professional opinions as to the reasons their students had maintained or improved SAT scores. This pamphlet then gives guidelines for better preparation in various fields. Under the heading "The Mathematics Programs" the last paragraph reads as follows:

"Aside from the questions of course content and course enrollment, what may a school do to improve the preparation of high school students in mathematics for rigorous tests and college courses? The Board of Governors of the Mathematical Association of America and the Board of Directors of the National Council of Teachers of Mathematics in 1977 released recommendations for preparing students for college-level mathematics. Their recommendations are included as Appendix B of this report." In Appendix B there appears the MAA-NCTM document in its entirety.

The MAA-NCTM document first lists the necessary course work to be covered in high school mathematics courses and follows this with a list of 10 specific recommendations. The first of these shall serve as an example:

"Proficiency in mathematics cannot be acquired without individual practice. We, therefore, endorse the common practice of making regular assignments to be completed outside of class. We recommend that parents encourage their children to set aside sufficient time each day to complete these assignments and that parents actively support the request of the teachers that homework be turned in. Students should be encouraged to develop good study habits in mathematics courses at all levels and should develop the ability to read mathematics."

The statement on preparation needed for collegiate level courses in mathematics is confined to necessary course work. We do not delude ourselves into thinking that the issuing of a statement on high school course content will change overnight the curriculum and the preparation of entering freshmen. But we feel that the existence of such a statement can provide support for teachers, parents or administrators who want to emphasize parts of the curriculum that we think are essential for students planning to take collegiate level courses in mathematics.

The officers of both the NCTM and MAA attach highest importance to this statement and the recommendations. I have tried to convey these views in a letter which was sent in December 1977 to all members of the MAA together with a copy of the document. Let me quote the last few paragraphs from that letter:

"Many of these recommendations should help teachers of mathematics implement what they would have liked to do for some time, but felt they could not do without appropriate backing. The approval of these recommendations by the two largest organizations of teachers of mathematics on the North American continent should provide the needed support to the high school teachers of mathematics whose sincere efforts and hard work - in the face of many obstacles - deserve our wholehearted backing.

"You can be of great help in our efforts to secure widest possible implementation of the recommendations in this document:

"1. We urge you to make copies of this document available to all who are in a position to act on the recommendations, specifically those concerning the content of high school mathematics courses, the importance of homework assignments in mathematics, maintenance of proper grading standards, the dangers of advancement of students without appropriate achievement, the need for cumulative evaluations throughout each course, and so on. In particular, we hope that you will make sure that this document is available to all mathematics instructors in your community (high school, two-year college, four-year college and university), school and college administrators, guidance counselors, school boards, and PTA's.

"2. It would be most helpful if you could arrange to publicize the recommendations in your local newspaper and other media. This is particularly important in order to reach as many parents as possible to whom some of these recommendations are addressed (see, in particular, recommendation 1).

"3. Please note in particular recommendation 8, encouraging the continuation and invitation of joint meetings of college and secondary mathematics instructors and counselors at the local level in order to improve communication concerning mathematics prerequisites for careers, preparation of students for collegiate mathematics courses, and so on. If you are a college teacher, we hope you will seize the initiative to organize such a meeting in your community, include a discussion of the enclosed document and distribute copies to those in attendance.

"I believe widespread implementation of the advice and recommendations in the enclosed document can have a profound effect on substantially increasing the number of students who can perform well in college mathematics courses. Indeed, I hope -- and have every reason to believe -- that the effort now being undertaken by the mathematical community, the first to respond after release of the report of the CEEB Panel, may well set a model for other fields in which similar problems have been encountered in recent years.

"The officers of the MAA are very grateful to you for any help you can give in assisting us in this most important task. If you have any suggestions on additional steps which might be taken to assure success for this endeavor, I would greatly appreciate hearing from you."

Let me use this opportunity to extend this appeal to all members of AWM, many of whom have already shown a special interest in widespread dissemination and implementation of these recommendations.

Copies of both the brochures mentioned above are available free of charge in limited quantity from the MAA, 1529 Eighteenth Street, N.W., Washington, D.C. 20036.

Professional opportunities in mathematics

This popular brochure appeared originally in the January 1951 issue of the Monthly and has been revised regularly since. The latest edition is the ninth which appeared in April 1974. This brochure is designed for the secondary school or college student who is interested in mathematics as a career, and for his or her faculty advisor. It is intended to give an overview of the kinds of jobs available, and the salaries which might be expected. It attempts to give an idea of the education necessary for various jobs, and the working environments of the jobs.

The brochure is available from the Washington office of the MAA at the address given above for fifty cents per copy.

The tenth edition of this brochure, to be renamed PROFESSIONAL OPPORTUNITIES IN THE MATHEMATICAL SCIENCES, has just been prepared and should be available for distribution before the end of 1978.

You WILL need math

This brochure which has just been prepared by the Committee on Advisement and Personnel replaces the former YOU'LL NEED MATH. It is designed for the junior high school student regardless of whether or not he or she wishes to enter college. It lists the minimal amount of mathematics needed for a great variety of careers, including policeman,

fireman, bank teller, nurse, photographer, airline pilot, physician, among many others. It also tries to answer a number of questions a junior high school student might ask, such as "Will mathematics be important in my future work?" or "Can I get a job without taking mathematics beyond arithmetic of the elementary and junior high school?" The brochure also gives some helpful advice such as: "Having more than the minimum demands in mathematics for a job will give you a strong competitive advantage over others in the same job."

This brochure is not expected to be available for free distribution by the MAA office until some time early in 1979.

A career booklet

The MAA's WAM Project (Women and Mathematics) is proposing a brochure featuring a number of individuals who are practicing mathematicians or substantial users of mathematics. This brochure will give profiles of a substantial number of women, and therefore, should be of particular interest to AWM.

This brochure is, however, only in the preliminary states of preparation, and it would be premature to predict when it will become available.

Conclusion

Members of AWM can play a significant role in the effort to assure adequate mathematical preparation of high school students for college work - and thereby enable them to keep their career options open - by making widely available the brochures mentioned in this article and by helping in all possible ways to implement the recommendations they contain. All available evidence indicates that by far the most promising approach toward assuring appropriate preparation for college level mathematics courses is by insisting on necessary preparation in high school rather than through remedial college courses which - even with the best available efforts and intentions - cannot be as effective as the equivalent high school courses since they cannot cover in a one-semester or, worse yet, a one-quarter course the same material covered, say, in a one-year intermediate high school algebra course. Hopefully an intense effort, as is now underway, to impress upon junior high school students the critical importance of taking the necessary course work in mathematics in high schools will greatly decrease - and hopefully eliminate - the need to offer in the future remedial mathematics courses in college.

DATA ON WOMEN IN SCIENTIFIC RESEARCH: Part 4

by Betty M. Vetter, Executive Director, Scientific Manpower Commission

Research in Industry

Sixty-seven percent of the 540,000 R&D scientists and engineers were employed in industry in 1976 - down from 73% in the early sixties.[1] From 1973 to 1975, industrial employment of doctoral scientists and engineers rose 16% to 66,000. The total number of scientists and engineers grew 13% during this period - from 245,000 to 278,000, with women making up 9.4% of the 1975 doctoral scientists and engineers compared to 8.7% in 1973. In 1975, about 23% of all doctoral scientists and engineers were employed in industry.[2] Among these 65,876 doctorates, 4,322 (6.6%) were primarily in basic research, 15,810 (23.9%) in applied research and 8,795 (5.7%) in management of R&D.

Only 2,172 doctoral women (9.6% of all employed doctoral women) worked in industry[3], but we have no data by sex correlating work activity and type of employer. Thus, while we do not know whether the proportion of these women performing research in industry is similar to the proportion among all scientists and engineers employed in industry, we do know that women are less likely than men to be employed in industry and that engineers are more likely to be employed in industry than are scientists. When engineers are excluded from the data (since there are few women in the engineering population), we find that among about 218,000 employed doctoral scientists, 43,341 (19.8%) are working in industry. This is more than twice as high a proportion as among women. Within this group of doctoral scientists, 3,491 (9.1%) are in basic research, 10,946 (24%) are in applied research, 3,405 (7.8%) in developed and 12,096 (27.9%) in the administration or management of R&D. In all work settings combined, women in almost all science fields appear

to be more likely than men to be in basic research, less likely to be in applied research and much less likely to be in development or in management or administration of research (Tables 1 and 3). Whether this holds true in industry is not known.

The 265,000 doctoral scientists and engineers in the labor force in 1975 include 2,500 who were unemployed and seeking jobs. Among those who were employed, 14.1% (20% of women) were engaged in basic research, 12.2% (5.9% of women) in applied research, with an additional 4% (1% of women) working in development and 10.6% (5.9% of women) being principally engaged as managers or administrators of R&D.[4]

Although data are not available by sex to correlate work activity with employment setting, the small proportion of all doctoral women scientists and engineers employed in industry, further fragmented by the small proportion engaged in research, indicates that the numbers of these women performing research in an industrial setting must be small, and their proportion of the total undoubtedly smaller than their representation among all doctoral scientists and engineers.

Research in Government

Women scientists and engineers make up varying proportions of persons working in the federal government, according to data for 1975 provided by the Civil Service Commission, ranging from 32.7% of social scientists and psychologists to 1.5% of engineers (Table 13). These data do not include any information about grade level, work activity, or educational attainment. Civil service information on professional employment in 1973 shows only 1,874 women professionals (6.3% of total 29,533) in the physical sciences; 1,130 (4.5% of total 24,902) in the biological and agricultural sciences; and 3,115 (20.4% of the total 15,280) in the social sciences including psychology.[5] We have no information about the work activity of these women, and do not know what proportion may be involved in research.

A study by Rosalind B. Marimont[6] of women and men employees of the National Institutes of Health found that 1,025 women were 43% of total scientists employed, but the median GS grade for men was GS-14.07 (for a median salary of $24,430) while the women had a median grade of only GS-9.68 with a median salary of $12,980.

Among the doctorate staff (Ph.D.'s and M.D.'s) in 1972, were 66 women and 479 men. The median grade for the 12% who were women was 13.56, while for men it was 14.83. The median salary difference was $4,900 less for women than men. Put another way, women earned only 61% of what men earned, and a woman's chance for a senior job was only one-seventh that of a man. By 1976, her salary was 62% of his, and she still was only one-seventh as likely as he to reach senior staff level. Among all scientists (all degree levels) at the National Institutes of Health, women earn 58% of men's salaries, and a man's chance of holding a senior position is five times that of a woman.

Table 13: Full Time Federal Employment by Occupational Group and Sex, 1974-75

Source: U.S. Civil Service Commission, Press Release, October 31, 1975

	October 31, 1974			October 31, 1975			% Change	
	Total	Women	% T	Total	Women	% T	Total	Women
Soc. Sci. & Psych.	44,956	14,068	31.3	48,201	15,754	32.7	7.2	12.0
Biol. Sciences	44,476	3,601	8.1	45,615	3,827	8.4	2.6	6.3
Eng. & Arch.	146,490	1,990	1.4	151,560	2,288	1.5	3.5	15.0
Phys. Sci.	41,025	3,668	8.9	41,643	3,814	9.2	1.5	4.0
Math. & Stat.	13,805	5,015	36.3	14,226	4,981	35.0	3.0	-.7

NOTES

1. NSF, National Patterns of R & D Resources, Funds and Manpower in the United States, 1953 to 1977, NSF 77-310, p. 12.
2. NSF "Largest Increase of Employment of Doctoral Scientists and Engineers is in Industrial Sectors: 1973 to 1975", NSF 76-326, October 28, 1976, p. 1
3. NSF, Characteristics of Doctoral Scientists and Engineers in the United States, 1975, NSF 77-309, p. 115.
4. ibid, pp. 44-47, 115.
5. Scientific Manpower Commission, Professional Women and Minorities, A Manpower Data Resource Service, May 1975 and supplements Feb. 1976, Oct. 1976, and July 1977, pp. 171, 404, 485.
6. Marimont, Rosalind, "Disparity in Rank, Grade and Salary Between Women and Men Employees at NIH and in NINCDS." May 1977, unpublished.

OF POSSIBLE INTEREST

The advisory committee of Puerto Rican scientists to the American Association for the Advancement of Science requests assistance in identifying Puerto Ricans in the U.S. involved in the fields of science or engineering. A directory will include names of Puerto Rican students enrolled in science and engineering programs, individuals with advanced, doctoral or postdoctoral degrees, and persons working in science and engineering careers in all sectors--private and public. The deadline for the directory has already passed, but information received late will be saved for a supplement. Send names to AAAS/Office of Opportunities in Sciences, 1776 Massachusetts Ave., N.W., Washington, D.C. 20036.

Published or unpublished research on any aspect of women in education that was conducted and/or written up during 1977-78 is eligible for the second annual "Research on Women in Education" award. January 10, 1979 is the deadline for submission of three copies (on two of which the author is not identified; refereeing will be blind) of the entry and a short (200-250) abstract to Dr. Maija S. Blaubergs, Co-ordinator-Elect, Women Educators, 325 Aderhold, University of Georgia, Athens, GA 30602.

Springer-Verlag is publishing A Russian Childhood by Sofya Kovalevskaya, the childhood reminiscences of the 19th-century Russian woman mathematician. The book contains a thorough introduction and a summary of Kovalevskaya's mathematical work by P. Y. Polubarinova-Kochina, USSR Academy of Sciences. Kovalevskaya might well be called a "renaissance woman." At thirteen she was a mathematics prodigy; as a young woman she earned her doctorate in mathematics; she was one of the first women to hold a university professorship (at the University of Stockholm); she was awarded the Prix Bordin (comparable to the Nobel Prize today) for her work in mathematical physics; and she was the first woman to become a Corresponding Member of the arch-conservative Russian Imperial Academy of Sciences. Her literary output includes a novel, two plays, a personal reminiscence of George Eliot, a critical article on M. E. Saltykov-Shchedrin, a small body of verse, and a collection of short stories, sketches, and journalism. Throughout her life she was much concerned with women's rights. The book can be ordered from Springer-Verlag New York, Inc., 175 Fifth Avenue, New York, NY 10010 for $10.00.

The American Association for the Advancement of Science (AAAS), with support from the NSF, has recently embarked on a project of Intergovernmental Research and Development. Under the auspices of the Intergovernmental Science, Engineering, and Technology Advisory Panel (ISETAP) within the Office of Science and Technology Policy (OSTP), state, regional and local government officials and public interest groups have identified their most pressing problems. Now AAAS has been asked to present these problems to the scientific, engineering, and professional communities to obtain their views on how science and technology can contribute to the solution or amelioration of these problems through R&D programs or technology transfer mechanisms. The ten problem areas are community and economic development; energy; environment; fire safety and disaster preparedness; health; human resources; management, finance, and personnel; police and criminal justice; public works

and public utilities; and transportation. AAAS is convening working groups for each of these areas.

Total Environmental Action, Inc., is running a series of workshops on energy alternatives from now until April. Sample topics: solar hot water for your home, organic gardening, energy conservation. TEA also publishes Solar Age. For information, write TEA Inc., Church Hill, Harrisville, N.H. 03450.

The 1979 Society of Women Engineers National Convention and Student Conference will be held at the Hyatt Regency Hotel, Embarcadero in San Francisco from June 29 through July 3, 1979. The theme of the convention is "Investment in your Future" and will consist of a professional program and a technical program augmented by tours. All speakers will be women. Papers for the professional program will fall into the following areas: dealing in other professional areas, how to improve yourself physically, professional enhancement through more education, how women differ from men, rights of women, how we can contribute, women's place in history, improving your professional image, your career and family relationships, and some aspects of the California experience too interesting to overlook. Inquiries should be sent to SWE 1979 National Convention, P. O. Box 20, San Francisco, CA 94101.

Guidelines for the National Science Foundation's Science for Citizens program are available from: Science for Citizens, Office of Science and Society, National Science Foundation, Washington, D.C. 20550 (202/282-7770). The SFC program enables individuals and organizations to undertake activities which make scientific and technical assistance available to citizens and citizen groups so that they may deal effectively with public policy issues that have a direct impact on their lives. Public Service Science Residencies enable experienced scientists and engineers to work with citizen groups and other appropriate host organizations in need of their expertise (such as public interest groups, trade unions, units of state and local government, and educational institutions with community outreach programs). Appropriate projects include: development of handbooks, exhibits, radio and TV programs, workshops, and other informal science education activities for adults; data analysis and dissemination; and small-scale research on specific problems associated with current issues. The deadline for filing applications is February 1, 1979; awards will be announced in May 1979. SFC Forums, Conferences, and Workshops are intended to provide objective scientific information necessary for the informed discussion of local policy issues involving science and technology. The deadline for submission of preliminary proposals is January 15, 1979.

INTERNATIONAL CONFERENCE FOR MATH EDUCATION

The Bay Area Math Science Network is submitting a proposal to the program committee of the Fourth International Congress on Mathematics Education for a mini-conference (a group of talks) on "Women in Mathematics". The congress will be held in Berkeley in August, 1980. It is critical for us to show that there is international interest in "Women in Mathematics". We need the names of feminists from outside North America who are interested in Math Education. We particularly need women from Africa and South America. Please send names and addresses to: Diane Resek, Math. Dept., San Francisco State University, 1600 Holloway, San Francisco, CA 94132.

WOMEN ACTIVE IN SIAM

Dr. Maxine L. Rockoff is the new Chairman of the SIAM (Society for Industrial and Applied Mathematics) Board of Trustees. She is Health Science Administrator, Division of Extramural Research, National Center for Health Services in Hyattsville, MD. Her Ph.D. in mathematics is from the University of Pennsylvania.

Rockoff believes that SIAM has not only the opportunity but also the responsibility to foster applications of mathematics. The SIAM Education Committee is encouraging the formation of SIAM University Chapters. A careers booklet targeted at sophomores is being developed. Rockoff has also suggested that SIAM work with the National Council of Teachers of Mathematics to introduce elementary and high school students to applied mathematics.

Dr. Edith H. Luchins of Rensselaer Polytechnic Institute has become a Contributing

Editor for the SIAM News. Her Ph.D. is from the University of Oregon. Her primary research interests lie in functional analysis and in applications of mathematics to philosophy and psychology, particularly areas of logical foundations, learning and perception. She is deeply interested in the history of mathematics and women in mathematics. Under an NSF grant, she has directed a study of the problem of the scarcity of women in mathematics and its causes.

NSF FELLOWSHIPS. The NSF has just announced fifteen postdoctoral fellowships in the mathematical sciences, for those who have held the doctorate for no more than 4 years as of 2/1/79. Applications to NSF Postdoctoral Research Fellowship Office, c/o American Mathematical Society, P. O. Box 6248, Providence, Rhode Island 02940 postmarked by 2/1/79.

DEADLINES: Jan. 24 for Mar.-Apr.; Mar. 23 for May-June; May 24 for July-Aug.

ADDRESSES: Send all copy to Anne Leggett, Dept. of Math., Univ. of Texas, Austin, TX 78712.

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 $5.00 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. Dept. of Mathematics. Two tenure track Assistant Professorships for 1979/80. PhD required. Candidate must be interested in teaching, undergraduate and MS level, and in pursuing a research program. Salary negotiable. Full fringe benefits. Send vita and 3 letters of reference to Peter V. O'Neil, Chairman, Dept. of Mathematics, University of Alabama, Birmingham, Birmingham, AL 35294.

The University of Alabama in Huntsville. One Instructor in Mathematics position open in tenure earning track, beginning Sept. 1, 1979. Master's degree in mathematics required. Usual fringe benefits. By Feb. 16, 1979 send letter of application, vita, transcripts, with 3 letters of reference to F. L. Cook, Chairman, Department of Math, The University of Alabama in Huntsville, Huntsville, Alabama 35807.

University of Arizona. Dept. of Mathematics. Possible one-year temporary positions beginning August, 1979. Also may have one or more tenure eligible positions one of which may be in Numerical Analysis, at level depending on qualifications of applicant. Send applications and resumes to T. Laetsch, Head, Dept. of Mathematics, Univ. of Arizone, Tucson, AZ 85721.

University of California, Berkeley. Dept. of Statistics.
(1) Lecturer in probability theory. This is temporary one-year position for 1979/80. Salary negotiable. Qualifications: fine teaching record and ability to teach advanced courses in area of stochastic processes; promising research record.
(2) Lecturer in applied statistics. This is temporary two-year position with salary negotiable, beginning Fall 1979. Qualifications: fine teaching record and ability to teach advanced courses in applied statistics and supervise a departmental statistical consulting service; strong research record.

University of California, Berkeley. Dept. of Statistics. Tenure track position to start Fall, 1979 to teach graduate and undergraduate courses in Statistics. Also Assistant Professorship to start Fall, 1979; applicant's fields of specialization should include a branch of probability theory;and will be considered for teaching graduate and undergraduate courses in probability and statistics. Inquiries should be directed to Peter J. Bickel, Chairman, Dept. of Statistics, University of California, Berkeley, CA 94720.

University of California, Berkeley. Dept. of Mathematics. At least one tenure track faculty position open Fall, 1979 in areas of algebra, analysis, applied mathematics, foundations or geometry. Demonstrated potential in research and teaching necessary. By January 15, 1979 send vitae, list of publications and 3 letters of recommendation to R. Hartshorne, Vice-Chairman for Faculty Appointments, Dept. of Mathematics, University of California, Berkeley, Berkeley, CA 94720.

University of California, Berkeley. Dept. of Mathematics. Several two year lecturer positions beginning September, 1979 for new and recent PhD's regardless of age. Send by Feb. 15, 1979 resume, reprints, preprints and/or thesis abstract and 3 letters of recommendation to R. Hartshorne, Vice-Chairman for Faculty Appointments, Dept. of Mathematics, University of California, Berkeley, Berkeley, CA 94720.

University of California, Davis. Dept. of Mathematics. Assistant Professorship in applied mathematics or computer science, beginning fall, 1979. PhD required. By March 1, 1979 send resume and three letters of recommendation to Dr. David G. Mead, Chairperson, Dept. of Mathematics, University of California, Davis, Davis, California 95616.

University of California, Davis. Dept. of Mathematics. One or more senior appointments in applied mathematics or computer science beginning July 1, 1979. Prefer candidates who have a demonstrated interest and ability for mathematical interaction with researchers in other disciplines, and for the teaching of mathematics. By January 12, 1979 send resume and three letters of recommendation to Dr. David G. Mead, Chairperson, Dept. of Mathematics, University of California, Davis, Davis, California 95616.

University of California, Davis. Division of Statistics. Two openings at tenured level beginning Fall, 1979. Salary, rank and area of specialization are open. Experience in administration desirable. One of appointees will serve as head (Associate Dean) of Division. Qualifications for both positions include strong research record and interest and competence in teaching and statistical consultation. Resume and 4 letters of recommendation should be sent before Feb. 15, 1979 to Professor Francisco J. Samaniego, Chair, Statistics Search Comm., c/o Office of Academic Affairs, University of California, Davis 95616.

San Diego State University. Dept. of Mathematical Sciences. Several tenure track openings in Computer Science beginning Fall, 1979 or, if appropriate, spring semester, 1979. Qualifications: PhD or PhD to be completed by Sept., 1979. Commitment to quality teaching. Competence in research & publication in Computer Science. Applicant's strengths should be computer systems, architecture & software; or language design & theory; or algorithm design & analysis, or micropressors and minicomputers. Salary range: $15,624 - $27,348. By 1/15/79 send vitae and names of 3 references to Search Committee, Dept. of Mathematical Sciences, San Diego State Univ., San Diego CA 92182.

San Diego State University. Dept. of Mathematical Sciences. Tenure track opening in Mathematics Education beginning Fall, 1979. Qualifications: PhD or PhD to be completed by Sept., 1979 in Mathematics Education, or its equivalent. Commitment to quality teaching, competence in research and publication in Mathematics Education. Interest in curriculum development. Teaching experience at elementary or secondary level. Salary range: $15,624 - $17,135. By 2/15/79 send vitae and names of 3 references to Search Committee, Dept. of Mathematical Sciences, San Diego State Univ., San Diego, CA 92182.

San Jose State University. Dept. of Mathematics. Assistant Professorship starting Fall, 1979. PhD in Computer Science or in Mathematics with demonstrable competence in Computer Science and/or Mathematical Modeling, i.e. in life sciences, physical sciences or business and economics. Candidates must have demonstrated high ability and interest in teaching at undergraduate level and be able to take active role in curriculum development. Salary rage: $14,256 - $17,136. Teach 12 hours per semester. Tenure possible in 1 to 6 years. By 2/1/79 send applications to Dr. John Mitchem, Chairman, Dept. of Mathematics, San Jose State University, San Jose, CA 95192.

University of Southern California. Dept. of Mathematics, Los Angeles, CA 90007. Several openings at Assistant Professor level anticipated for Sept., 1979. Term level appointments to do research and teach two undergraduate courses each semester. Strong research potential required. Salary in excess of $16,000 per academic year.

Wesleyan University. Dept. of Mathematics. Assistant professor (tenure track) in analysis, starting September, 1979. Send vita and 3 letters of reference to Ethan M. Cohan, Dept. of Mathematics, Wesleyan University, Middletown, CT 06457.

Yale University. Department of Mathematics. Three Gibbs Instructorships for PhDs with outstanding promise in research. Two-year appointment starting July 1, 1979. Teaching load light. Deadline for applications February 1, 1979. Applications from women and minority group members welcome. Salary in 1978-79 is $15,500; an increase is expected for 1979-80. Contact: Gibbs Committee, Box 2155 Yale Station, New Haven, Connecticut 06520.

Gallaudet College. Dept. of Mathematics. Faculty position, Fall, 1979, teaching college preparatory math at world's only liberal arts college for the deaf. MA or PhD in math required. Salary $12,000 - $19,000 (9 mo.) based on experience. Paid to attend mandatory summer program to learn sign language in order to communicate with deaf. By March 1, 1979 send applications to Math Dept., Gallaudet College, Washington, D.C. 20002.

Emory University. Dept. of Mathematics. One or more assistant professorships available for 1979-80. Candidates should have strong research interests and promise of excellence in teaching. Prefer qualified candidates in areas of computer science and statistics, and in areas of differential equations, numerical analysis, algebra, combinatorics, who have a secondary interest in computer science or statistics. See latest issue of the AMS Employment Information in the Mathematical Sciences for up-to-date information on status of these jobs. Contact Trevor Evans, Chairman, Dept. of Math, Emory University, Atlanta, GA 30322.

Chicago State University. Dept. of Mathematics. Assistant Professor (tenure track). Salary is negotiable. PhD in Computer Science is preferred; will consider an MS in Computer Science with extensive industry or academic experience. Responsible for development of undergraduate computer science program, and for teaching courses in operating systems, programming languages, compiler construction, computer organization and other advanced topics. Submit resume to Robert L. Bernhardt, Chairman, Dept. of Math, Chicago St. Univ., 95th & King Drive, Chicago, IL 60628.

Chicago State University. Dept. of Mathematics. Assistant Professor (tenure track). Salary $13,000 (10 mo.) PhD in Math who can teach at every level of undergraduate mathematics and who has strong interest in remedial mathematics (junior high arithmetic and algebra). Would devote 2/3 of course load to remedial mathematics. Candidates with interests in statistics and computer science will be given high priority. Send resume to Robert L. Bernhardt, Chairman, Dept. of Math, Chicago St. Univ., 95th & King Drive,Chicago IL 60628.

University of Illinois - Chicago Circle. Dept. of Mathematics. Junior or Senior openings in pure mathematics, applied mathematics, statistics, computer science and mathematics education. PhD required. First consideration given to applications recieved by Jan. 15, 1979. Send vita, publication list and at least 3 letter of recommendation to Philip Dwinger, Head, Mathematics Dept., University of Illinois - Chicago Circle, Box 4348, Chicago, IL 60680.

University of Illinois - Urbana/Champaign. Dept. of Mathematics. Asst. Professorship in partial differential equations and applied mathematics. PhD required. Candidate should have ability to teach mathematical analysis and its relations to physical concepts to undergraduate and graduate students in mathematics, science and engineering. Salary at least $17,000. Deadline date 2/2/79. Write Paul T. Bateman, Head, Dept. of Mathematics, University of Illinois, Urbana/Champaign, Urbana, IL 61801.

University of Illinois - Urbana/Champaign. Dept. of Mathematics. Several visiting lectureships beginning 8/2/79. PhD in Mathematics required. These are temporary positions of at most two years duration. Salary$15,000. Deadline date 2/2/79. Write Paul T. Bateman, Head, Dept. of Mathematics, University of Illinois - Urbana/Champaign, Urbana, IL 61801.

University of Illinois - Urbana/Champaign. Dept. of Mathematics. If funds are available, we expect to have Asst. Professorship beginning 8/21/79 with no limitation as to field. PhD required. Demonstrated excellence in research will be primary criterion for selection. Salary $17,000. Deadline date 2/2/79. Write Paul T. Bateman, Head, Dept. of Mathematics, University of Illinois, Urbana/Champaign, Urbana, IL 61801.

Northwestern University. Dept. of Mathematics. Two or three Assistant Professorships 1978-81 (not renewable); preferred fields commutative harmonic analysis, functional analysis or complex analysis. Visiting positions 1979-80; preferred fields commutative harmonic analysis, functional analysis, complex analysis, algebra, global analysis, statistics. Deadline for all position applications: 2/15/79. Send resumes and vita to R. P. Boas, Chairman of Personnel Committee, Dept. of Mathematics, Northwestern University, Evanston, IL 60201.

Southern Illinois University at Carbondale. Dept. of Mathematics. Tenure track assistant professorships in: Number Theory (all fields), Partial Differential Equations, and Numerical Analysis, beginning 8/15/79. PhD by 8/15/79, serious research interests and potential for superior teaching required. Address applications to Desired Position, c/o Alphonse Baartmans, Chairman, Dept. of Mathematics, Southern Illinois University, Carbondale, IL 62901 by 2/15/79. Also anticipated position in Operations Research.

Southern Illinois University at Carbondale. Dean of the College of Liberal Arts, to start Aug. 16, 1979. Dean provides academic and administrative leadership of the College and reports to Vice President for Academic Affairs and Research. Candidate must provide evidence of strong commitment to excellence in teaching and research, successful administrative experience and interest and will hold rank of Professor in one of departments which include Anthropology, Computer Science, Economics, English, Foreign Languages, Geography, History, Mathematics, etc. By Feb. 15, 1979 send applications to Dr. John S. Jackson, Chair., COLA Dean Search Committee, c/o V. P. for Academic Affairs and Research, Southern IL Univ. at Carbondale, Carbondale, IL 62901.

Western Illinois University. Dept. of Mathematics. Three tenure track positions (one in Computer Science, another in Operations Research, Mathematical Programming or Optimization Theory) and one or more temporary positions are available. Computer Science position calls for experience in some area of theoretical computer science and an interest in expanding and developing a small undergraduate program. Operations Research position calls for interest in computer implementation of solutions to real world problems. These positions could be filled in January. Rank & salary open. Send resumes, transcripts & 3 letters of recommendation to Professor J. Burlak, Math Department, Western Illinois University, Macomb, IL 61455.

Indiana University, Bloomington. Dept. of Mathematics. One senior position in department beginning August, 1979. Would like candidates in field of probability and/or statistics, but will consider outstanding candidates in any field. Demonstrated excellence in research and teaching necessary. Contact M. Lowengrub, Chairperson, Dept. of Mathematics, Indiana University, Bloomington, Bloomington Indiana 47401.

Indiana University, Bloomington. Dept. of Mathematics. Three Assistant Professorships for 1979/80. We are particularly interested in candidates whose fields are algebra, topology, numerical analysis, but will consider outstanding candidates in any field of mathematics. Contact M. Lowengrub, Chairperson, Dept. of Mathematics, Indiana University, Bloomington, Bloomington, Indiana 47401.

Indiana University, Bloomington. Dept. of Mathematics. Assistant Professorship in Statistics beginning August, 1979. Welcome new PhD's as well as those who have demonstrated distinctions in research and teaching. Contact M. Lowengrub, Chairperson, Department of Mathematics, Indiana University, Bloomington, Bloomington, Indiana 47401.

University of Iowa. Director of University Computing. Person in this position will have primary responsibility for policies and planning of development of all computing at University of Iowa. Qualifications include demonstrated leadership in an academic, research or high technology industrial setting; understanding of financial and management systems in large diversified organizations. Send resume to Chairman, Search Committee, Director of University Computing, 205 Gilmore Hall, University of Iowa, Iowa City, Iowa 52242.

Kansas State University. Dept. of Statistics. Two permanent positions beginning 9/1/79, Assistant Professor and Assistant/Associate Professor. PhD required with interest in Theory or applied areas of Sampling, Design, Stochastic Processes, Bioassay, Multivariate or Probability. Serve as advisor to graduate students. Require independent, publishable research. Contact Dr. Arthur D. Dayton, Head, Dept. of Statistics, Kansas State University, Manhattan, KS 66506.

University of Maryland. Dept. of Mathematics.
Assistant Professor in Applied Mathematics beginning August, 1979. Joint appointment with Institute for Physical Science and Technology and Mathematics Dept. New or recent PhD with outstanding research potential. Initial appointment for 3 years; possibility for tenure.
Some positions, beginning Aug., 1979, in mathematics and statistics at assistant professor level (tenure track). Strong research potential required. Also possibility of senior position.
Send vita and 3 letters of recommendation to Professor W. E. Kirwan, Chairman, Dept. of Mathematics, University of Maryland, College Park, MD 20742.
One position in Algebra and Number Theory. Of particular interest is a number theorist or an algebraist or an algebraic geometer with collateral interests in number theory.
One position in Functional Analysis. Of particular interest is a person who works in harmonic analysis or topological dynamics, or in the interactions of functional analysis with other fields.
By January 31, 1979 send applications and inquiries to Professor Kirwan listed above.

University of Massachusetts, Amherst. Dept. of Mathematics & Statistics. For year 1979/80, junior level tenure track position in statistics;junior level two or three year visiting position in applied mathematics (may lead to tenure); another junior level appointment in statistics may be possible. Resume, 3 letter of recommendation and graduate transcripts should be sent to Professor E. A. Connors, Head, Department of Mathematics and Statistics, Graduate Research Tower, University of Massachusetts, Amherst, MA 01003.

Smith College. The Mathematics Department has one tenure-track position at the associate or assistant professor level; it is available for 2 or 3 years beginning Sept., 1979. Current minimum salaries at the two ranks are $19,400 and $15,400. Teaching duties are 3 undergraduate courses per semester, one at the upper level. Evidence of superior teaching and significant scholarship is required. A second position, for 2 years at the assistant professor level may also be available.Please send resumes and three letters of recommendation to James Callahan, Chair, Mathematics Dept., Smith College, Northampton, MA 01063.

Worcester Polytechnic Institute. Dept. of Mathematics. Beginning assistant professor, tenure track. Applied mathematician with interests paralleling current research in the department (mathematical physics, applied analysis, coding theory) or specializing in operations research or applied probability. PhD required. Contact Paul W. Davis, Chair, Dept. of Mathematics, Worcester Polytechnic Inst., Worcester, MA 01609.

University of Michigan. Dept. of Mathematics. Expect to have several three year assistant professorships. Salary at least $15,000. By Jan. 15, 1979 send applications to Professor F. W. Gehring, Chairman, Dept. of Mathematics, Univ. of Michigan, Ann Arbor, MI 48109.

University of Michigan. Dept. of Mathematics. Expect to have positions at or near tenure level for persons working in one or more of following areas: applied mathematics, topology, number theory. Salary and rank dependent on qualifications. By Feb. 15, 1979 send applications to Professor F. W. Gehring, Chairman, Dept. of Mathematics, University of Michigan, Ann Arbor, MI 48109.

University of Michigan. Dept. of Biostatistics. Assistant Professorship with PhD starting Sept., 1979. Research, Teaching and consultation. Must have experience and training in statistical applications involving large and complex data sets and the development and utilization of computerized data base management systems. Contact Richard G. Cornell, Professor & Chairman, Dept. of Biostatistics, School of Public Health, Univ. of Michigan, Ann Arbor, MI 48109.

Michigan State University. Dept. of Mathematics. Openings at Assistant Professor level starting Fall term, 1979. PhD required; also strong research potential and teaching ability. Deadline 2/1/79. Send resume and three letters of recommendation to Professor J. E. Adney, Dept. of Mathematics, Michigan State University, East Lansing, MI 48824.

Oakland University. Dept. of Mathematical Sciences. Two tenure track assistant professorships beginning 8/15/79. PhD required. Preferred fields, numerical analysis, statistics, operations research, differential topology and global analysis. Salary $15,200. Send curriculum vitae to George F. Feeman, Dept. of Mathematical Sciences, Oakland University, Rochester, MI 48063.

Saint Mary's College. Dept. of Mathematics and Statistics is developing a cooperative applied statistics major with two other colleges in the city. PhD in mathematics or statistics is preferred. Permanent full-time position with advancement to possible tenure. Contact Louis A. Guillou, Chairman, Dept. of Mathematics and Statistics, Saint Mary's College, Winona, Minnesota 55987.

University of Minnesota. School of Mathematics. Starting 9/16/79 - 1, possibly 2, jr. positions. Preferred fields: algebra, geometry, harmonic analysis, mathematical logic, probability, topology; other fields also considered. Strong research and teaching abilities required. Preference given to individuals able to interact with related fields and with demonstrated knowledge of areas of application for their research. Salary competitive. Usual benefits. By 2/5/79 send applications to Willard Miller, Jr., Head, School of Mathematics, Univ. of Minnesota, Minneapolis, MN 55455.

Dartmouth College. Dept. of Mathematics. John Wesley Young Instructorship, a post-doctoral 2 year (1979-81) appointment intended for PhD graduates with strong interests in teaching and research. Current fields of interest are algebra, algebraic and geometric topology, analysis, probability theory, combinatorics, computer science and logic. Nine month salary $14,500. Must have completed PhD requirements by Sept., 1979. By Feb. 15, 1979 send vitae, graduate school transcript, thesis abstract and 3 letters of recommendation to Prof. Richard H. Crowell, Chairman, Atten: Recruiting, Dept. of Mathematics, Dartmouth College, Hanover, N.H. 03755.

University of New Hampshire. Assistant Professor in Mathematics or Statistics and Assistant Professor of Computer Sciences to begin Sept., 1979. PhD in respective fields required for each position. Deadlines:2/15/79 for Mathematics or Statistics position and 3/1/79 for Computer Science position. Contact M. E. Munroe, Chairman, Mathematics and Computer Sciences, M312 Kingsbury Hall, University of New Hampshire, Durham, N. H., 03824.

Princeton University. Dept. of Aerospace & Mechanical Engineering. Opening for research staff member. PhD required. Theoretical research, carried out mostly by numerical techniques, in fundamental combustion processes associated with practical combustors such as reciprocating and rotary engines, gas turbines, and furnaces. Send resume to Departmental Administrator, D-214 Engineering Quadrangle, Princeton University, Princeton, N. J. 08540.

Rensselaer Polytechnic Institute. Dept. of Mathematical Sciences. Two tenure track Assistant Professorships, starting Sept., 1979, one in applied mathematics and one in computer science. Visiting appointment also possible. Send resume to Professor R. C. DiPrima, Dept. of Mathematical Sciences, Rensselaer Polytechnic Institute, Troy, N.Y. 12181.

State University of New York, Buffalo. Dept. of Statistics. Three new tenure track Assistant Professorships in September, 1979. PhD's preferred with specializations in inference, sampling time series, and applied probability. Send curriculum vita and 3 letters of recommendation to Willard H. Clatworthy, Dept. of Statistics, State University of New York, Buffalo, 4230 Ridge Lea Road, Amherst, New York 14226.

Syracuse University. Dept. of Mathematics. One Assistant Professorship for mathematician working in differential equations, probability, or other fields of mathematics. Possibly a visiting position and perhaps other one-year terminal positions. PhD required and research potential is necessary. Would like visiting position application by Jan. 15, 1979; all others by Feb. 28, 1979. Send vita and three letters of reference to Professor J. E. Gaver, Dept. of Mathematics, Syracuse University, Syracuse, New York 13210.

Union College. Dept. of Mathematics. One Assistant Professorship starting Sept., 1979. Preferred fields: numberical analysis and applied mathematics. Applicants in other areas will be considered. Appointment will be for 2 years and terminal unless candidate has particularly strong credentials. Salary competitive, full range of fringe benefits, 9 hour teaching load. Contact Arnold Seiken, Chmn., Dept. of Math, Union College, Schenectady, N.Y. 12308.

Vassar College. Dept. of Mathematics. Two three-year renewable assistant professorships and one one-year nonrenewable position starting Sept., 1979. PhD required. Preferred fields are geometry, topology and applied mathematics. Salary around $14,000. Send resume to Professor David Merriell, Chairman, Dept. of Mathematics, Vassar College, Poughkeepsie, N.Y. 12601.

University of North Carolina, Chapel Hill. Mathematics Dept. One tenure track position and possible visiting positions for August, 1979. Special consideration will be given to those in Numerical Methods or related fields. Send 3 letters of recommendation and vita to Dr. William W. Smith, Chairman, Mathematics Department, University of N. Carolina, Chapel Hill, Phillips Hall 039A, Chapel Hill, N. C. 27514.

North Dakota State University. Dept. of Mathematical Sciences. Faculty position in Statistics, Fall of 1979. PhD in Statistics required; strong research potential and skill in teaching service courses. Background in social sciences desirable. Duties include teaching, research and statistical consulting with campus researchers. Contact Doris Hertsgaard, Dept. of Mathematical Sciences, N. Dakota State University, Fargo, N.D. 58105.

Kenyon College. Visiting Instructor, Assistant Professor, and three year temporary opening starting 1979/80. Experience in Computer Science and/or Statistics is desirable. By February 1, 1979 contact R. M. Fesq, Chairman, Mathematics Department, Kenyon College, Gambier, Ohio 43022.

Ohio State University. Dept. of Mathematics. We invite applications for several anticipated positions on our regional campuses. These campuses, located at Lima, Mansfield, Marion and Newark, provide instruction in mathematics at Freshman and Sophomore levels. Since these tenure track positions would have rank of Assistant Professor, continuing research as well as excellent teaching is expected of those appointed. Send resume and letters of recommendation to John Riner, Vice Chairman, Dept. of Math., Ohio State University, 231 W 18th St., Columbus, OH 43210.

University of Oklahoma. Dept. of Mathematics, Norman, OK 73019. Instructorships available for Fall 1979. One year appointment with potential of renewal for second year. 9 - 12 hour teaching load, principally elementary courses. Salary approximately $10,500. PhD desirable but not mandatory. Strong teaching credentials required. By Feb. 1,1979 send curriculum vitae and 3 letters of reference to Morris L. Marx, Chairman.

Bucknell University. Dept. of Mathematics. One position may open for September, 1979; qualifications include PhD (or nearly so), strong commitment to teaching and high potential for research. Desired specialty is statistics with broad training in both mathematics and statistics. Potential tenure. Send vitae, graduate transcript and three letters of recommendation to David S. Ray, Head, Dept. of Mathematics, Bucknell University, Lewisburg, Pennsylvania 17837.

University of Pennsylvania. Dept. of Mathematics. Limited number of teaching positions in algebra, analysis, and geometry-topology. PhD required. Positions start 7/1/79. By 1/15/79 send resume and 3 letters of reference to Professor S. S. Shatz, Chairman, Personnel Committee, Dept. of Mathematics, University of Pennsylvania, Philadelphia, PA 19104/E1.

College of Charleston. Department of Mathematics. One or two Assistant Professorships (tenure track) available Aug. 20, 1979. Teaching in an undergraduate mathematics and computer science program (12 hrs. per week). PhD in mathematics and continuing interest in research is required. Strong background in application of mathematics, statistics or computer science is preferred. Minimum salary $14,000. Send resume and 3 letters of recommendation to W. Hugh Haynsworth, Chairman, Dept. of Mathematics, College of Charleston, Charleston, S.C. 29401.

University of Tennessee. Dept. of Mathematics, Ayres Hall, Knoxville, TN 37916.
ALGEBRA. Tenure track position assistant (possibly associate) professorship. Active areas in dept. include ring theory, number theory. Contact David F. Dobbs.
MATHEMATICAL BIOLOGY. Participation with Knoxville-Oak Ridge area research institution expected. Preference given to applicants with interest in math ecology. Contact Thomas G. Hallam.
STATISTICS. Joint appointment with Dept. of Statistics in College of Business Administration. Expected to teach Math Statistics in Math Dept. and serve as liaison person with State Department. Contact Lida K. Barrett, Head, Mathematics.
NUMERICAL ANALYSIS/APPLIED MATHEMATICS. Interdisciplinary backgrounds, e.g. fluid mechanics are especially welcome. Specific interest in moving boundary problems or sparse matrix techniques desirable. Contact Max Gunzburger or Robert J. Plemmons.

Vanderbilt University. Dept. of Mathematics. Assistant Professorship (subject to administration approval). Initial 3 year appointment, renewable, tenure track. Outstanding research potential and evidence of effective teaching required; also specialization in some area of applied mathematics. Send vita and 3 letters of recommendation to Prof. R. R. Goldberg, Chairman, Dept. of Math, Vanderbilt University, Nashville, Tenn. 37235.

Vanderbilt University. Dept. of Mathematics. Tenure track assistant professorship in Statistics. Initial 3 year appointment. Strong commitment to research and undergraduate teaching required. Send vita and 3 letters of recommendation to Professor R. R. Goldberg, Chairman, Dept. of Mathematics, Vanderbilt University, Nashville, TN 37235.

University of Vermont. Dept. of Mathematics. Tenure track assistant professorship; preferred fields, operations research, applied mathematics, approximation theory or computational mathematics. Salary $15,000. Usual fringe benefits. Starting date: September 1, 1979. Contact Dr. Donald E. Maser, Chairman, Dept. of Mathematics, University of Vermont, Burlington, Vt. 05405.

George Mason University. Dept. of Mathematics. Three positions in areas of differential equations, general topology and analysis. PhD required by September, 1979. One position in computer science program. Candidate should have PhD in Computer Science or PhD in Mathematical Sciences with MS in Computer Science by September, 1979. Contact Zoltan Papp, Chmn., Search Committee, George Mason University, Department of Mathematics, Fairfax, Virginia 22030 by January 31, 1979.

George Mason University. Dept. of Mathematics. Three positions for regular faculty to complement current graduate program and personnel in operations research and applied statistics. PhD required by Sept., 1979. Candidate must possess potential or demonstrated ability in teaching and research, and expertise in one of these areas: applied mathematical statistics, mathematical programming, applied probability models. Send resume to Linn Sennott, Search Committee Chairperson, George Mason University, Fairfax, Virginia 22030 by Feb. 8, 1979.

University of Virginia. Dept. of Mathematics. We anticipate one to three assistant professorships for 1979. Preference is in probability/statistics and algebraic/differential topology,but strong applications in any area will be considered. Contact R. Stong, Dept. of Mathematics, c/o New Cabell Hall, University of Virginia, Charlottesville, Virginia 22903.

University of Washington. Dept. of Mathematics.

ASSISTANT PROFESSORSHIP. For PhD with strong research and teaching records. Two course teaching load. Three-year appointment starting September 1979 with possibility of renewal. Standard salary, TIAA and fringe benefits. Send vitae, bibliography and 4 recommendations to R. Phelps, Chairman, Dept. of Mathematics, GN-50, University of Washington, Seattle, WA 98195.

MATHEMATICS - Acting Assistant Professorships. Three two-year positions for PhD's with strong research and teaching potential. Two-course teaching load. Start Sept., 1979. Standard salary, TIAA and fringe benefits. Send vita, bibliography and 4 recommendations to R. Phelps, Chairman, Dept. of Mathematics, GN-50, University of Washington, Seattle, WA 98195.

ASSOCIATION FOR WOMEN IN MATHEMATICS
MEMBERSHIP APPLICATION

Name and
Address_____

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Institutional affiliation, if any_____

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