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ERA NEWS FLASH

At its February 12-17 meeting, the American Association for the Advancement of Science, a 125,000 member organization, voted to withdraw its 1979 Annual Meeting from Chicago, Ill. because that state has not ratified the ERA. (see next page for more info).

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PRESIDENT'S REPORT by Lenore BlumIMMEDIATE ACTION REQUESTED BY AWM MEMBERS, SEE BELOWMATH MEETINGS AND THE ERA:

At the January 1978 Business Meeting of the American Mathematical Society in Atlanta, a motion was made by Karen Uhlenbeck, and seconded by Bettye Anne Case, that the AMS try to hold all future meetings in states that have ratified the ERA. President Bing of the AMS ruled that the motion did not constitute "final action", but was proposed as a statement of sentiment of the Business Meeting. This motion passed by a standup vote of 173 to 99.

At the same Business Meeting the secretary of the AMS explained that although the site of the January 1979 Meeting (85th Annual Meeting) was changed from Milwaukee, Wisconsin to Biloxi, Mississippi because of weather, it could not be rechanged from Biloxi to another site due to prior hotel contracts. In addition to the Biloxi Meeting, three other future AMS Meetings are still scheduled in states which have not ratified the ERA: November 3-4, 1978, Charleston, SC; November 12, 1978 in Chicago, Ill.; August 21-25, 1979 (83rd Summer Meeting) in Blacksburg, Va.

Hence, the motion passed at the January 1978 Business Meeting appears to have had no effect on actual rescheduling. At the AMS Council Meeting on March 23, 1978 in Columbus, Ohio, I questioned why this was the case, in particular in regard to the Annual Summer Meeting in Blacksburg, Va. in 1979. The three most salient reasons given were: 1) Although no formal contracts have been made, the AMS Committee on Meetings does not feel it is ethical to rescind its gentlemen's agreement with colleagues at VPI. 2) This is a joint meeting with the MAA and the Committee on Meetings does not wish any unilateral action on the part of the AMS. 3) No alternative site possibilities are known at present.

The Council would not consider the Meetings issue further because it was not already on the agenda. However, Julia Robinson, Vice President of the AMS (hence ex-officio member of the Council) pointed out that this was an emergency situation in that the Council would not be meeting again until January 1979. She moved that the Meetings issue be placed on the agenda of the AMS Executive Committee which will meet in Providence, R.I. on May 12, 1978. This motion passed.

IMMEDIATE ACTION NEEDED

I urge each AWM member to write immediately to the AMS Executive Committee (c/o Heather MacDonald, AMS, P.O.Box 6248, Providence, R.I.02940) expressing your views on the Blacksburg, Va. meeting. Numbers will be important, so please urge your colleagues to also write. Even a brief note would be appropriate. I will also be submitting a statement for the Executive Committee agenda urging the AMS to seek an alternative location, and I would appreciate a copy of your letter.

You may wish to address the three points above so that the AMS can see how to resolve these issues for itself in some reasonable way. For example, one member of the Council pointed out that the strong sentiments of a sizable subgroup of the membership can justifiably take precedence over agreements made by a committee who were previously unaware of these sentiments. We hope the AMS Executive Committee and the MAA would also concur. In addition, alternative site suggestions would be helpful.

Sincerely,

*Lenore Blum*  
Lenore Blum

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Mills College, Oakland CA 94613

GOOD NEWS: AAAS ON ERA AND KENNEDY LEGISLATION

February 13th, 1978, the Board of Directors of the American Association for the Advancement of Science voted its support of the aims of the ERA and reaffirmed its previous position to hold future AAAS annual meetings only in states which have ratified the Amendment. The Board voted not to meet in Chicago in January 1979 as had been originally planned.

AAAS needs support for this courageous action. Other scientific societies will be watching to see what happens. Please send letters to William Carey, Executive Office, AAAS, 1776 Mass. Ave., N.W., Washington, D.C. 20036 and to Phil Ableson, Editor of Science. Encourage your friends, especially men, to write also.

On February 21st., Senator Edward M. Kennedy introduced legislation establishing a ten-year program to encourage the participation of women in science and technical careers. The Women in Science and Technology Equal Opportunity Act, cosponsored by Senators Willaims, Pell, Hathaway and Javits, will be summarized in the next issue.

ERA, AWM, AND THE AMS

by Evelyn Silvia

At the AWM meeting in Atlanta, questions were raised concerning courses of action open to us now that the next national meeting is firmly scheduled in Biloxi, Mississippi. Such meetings bring a lot of income into the state. CAN WE ATTEND THIS PROFESSIONAL ACTIVITY IN A STATE THAT HAS REFUSED TO RATIFY THE ERA WITHOUT VIOLATING OUR OWN CONSCIENCES?

Many people have already made the decision to boycott the meeting. On the other hand, many of us felt that we would like to have other forms of protest available to us. Among the suggestions made at the AWM meeting were fasting one day at the meeting to show symbolic support of the ERA, bringing our own food or setting up arrangements so that we need not patronize restaurants, having some form of staffed vigil, and wearing armbands or pins.

I have volunteered to coordinate our activities. Please help me by filling out the following form and sending it to: E.M. Silvia, Dept of Math., Univ. of California, Davis, Davis, CA 95616.

\_\_\_\_\_tear here or send Xerox\_\_\_\_\_

## I. Check one of the following:

- a.  My decision not to attend the meeting in Biloxi has nothing to do with Mississippi's position on the ERA.
- b.  I am not attending the meeting in Biloxi in protest of the meeting's location.
- c.  I am planning to attend the meeting in Biloxi.

## II. Check those which apply:

- I believe AWM should express public support of the ERA during the meeting in Biloxi.
- I would be willing to wear an AWM-armband in support of the ERA while attending the meeting in Biloxi.
- I would be willing to wear an AWM-pin in support of the ERA while attending the meeting in Biloxi.
- I support and would be willing to help staff a vigil expressing AWM's support of the ERA.
- I would like more information on possible fasting and restaurant boycotting in Biloxi.

## III. Other ideas and comments:

DECEASED

AWM has just learned of the death of Ruth Moufang last fall in Germany. Bhama Srinivasan is preparing an obituary for the Newsletter.

## AFFIRMATIVE DISTRACTIONS

by James C. Goodwin, assistant to the vice-president for state-wide university and student relations at the University of California  
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### Some institutions use curious techniques to avoid implementing affirmative action rules

Some years ago, the most prestigious Eastern universities recognized that as a result of regional differences in secondary education, few Southerners, Midwesterners, or other "provincials" could be expected to filter through the admissions screen; consequently, these universities waived college-board examinations for the non-Easterners, and substituted the criterion of the applicant's high school performance - a straightforward example of "preferential treatment" that no one was heard to complain about.

Instead, at that time, although the beneficiaries of preferential treatment were overwhelmingly white and male, this effort to achieve a pluralistic result was considered laudably democratic. The important point is that the university involved presumably recognized the value of pluralistic student bodies in the growth of students and in sound institutional development. And since education at a prestigious university has a decidedly favorable influence on later career opportunities and advancement, these institutions had a "democratizing" effect on business and professional leadership for the benefit of the society as a whole.

The current attempt to bring women and minorities into the educational system as students and professors through affirmative action is not meeting the same success as did the Eastern universities' geographical approach. Certainly, there is a great deal of talk about affirmative action, but a large gap separates rhetoric from reality.

Our society likes to claim that it is devoted to equality and social change. But, as the resistance to affirmative action shows, the educational system is designed to preserve social stasis. Affirmative action, properly used, could help disrupt that stasis. However, and this distinction is crucial, affirmative action rules cannot confer equality. As an immediate measure, they can move us a step toward the abolition of the ills of inequality.

Affirmative action rules are designed to provide places throughout educational and other public institutions for minorities and women who have in the past largely been excluded from conventional hiring and admitting processes.

Unfortunately, there is an irresistible temptation to exalt form over substance. By concentrating on complicated (if not meaningless) systems of data collection, computer printouts, and forms, institutions are not only burdened financially but distracted from the serious, difficult, and ultimately important job of implementation.

The great white marshmallow of university structure is antithetical to affirmative action. People at all levels of a university system speak readily about the problems of affirmative action, since everyone seems to consider it someone else's problem and disclaims the ability to deal with it on his or her own level. Throughout the nation, affirmative action offices are being demoted or rendered ineffective as they are moved further away from the decision-making centers within the patriarchal structure and substructures that make up the university. Through policy and inaction we see a broken-down charade acted out by the Department of Health, Education and Welfare (HEW) and the Universities, accompanied by the manipulation of data from ineptly tuned computers. As W.E.B. DuBois once said, "The greatest and most immediate danger of white culture, perhaps least sensed, is its fear of truth, its childish belief in the efficacy of lies as a method of human uplift."

Serious, open searches and objective selection of faculty members have failed to become the rule. Let me share a few examples of resistance. These are composite histories, drawn from actual events.

SMOKE SCREENS. A young Jewish male scholar with all the requisite qualifications for the position is told that he is the most qualified candidate but that he will not receive an offer. This scholar receives the following letter:

"I am sorry to report that although our department saw you as our top candidate we will not be able to make you an offer for our new position. Our university is an affirmative action employer and the department must attempt to fill the new position with an individual from a recognized oppressed minority group. Although the department initially viewed your ancestry as satisfying the requirement of affirmative action, consultation with our institutional advisors on the affirmative action program indicated to us that your ancestry does not qualify you as an oppressed minority. I wish you the best of luck in your future, and I am deeply sorry we were not able to extend an offer to you."

In fact, the institution has hired a less-qualified Anglo male candidate from the graduate school attended by the Anglo chairman of the department. The rejected scholar goes to the Anti-Defamation League, which writes to the President of the United States and others, alleging that well-qualified Jews are not being considered since institutions are forced to hire less-qualified women and members of minority groups to conform to affirmative action requirements.

NO SEARCH, JUST SEIZURE. Dean X has a qualified—but not the best-qualified—candidate whom he would like to hire for a certain high-level administrative position. The dean creates a position at a lower level and then argues that only the person he has previously selected has the special qualifications to do the job. Even if the position is listed, the personnel office will be unable to refer a successful candidate to Dean X, since the dean has already decided that the person he will hire is the one he has already selected. Once the candidate has been hired, he is swiftly promoted to the higher-level administrative position.

GOOD-FAITH EFFORT GAME PLAN NO. 1. Department Chairman Z knowingly offers a position to a minority or woman candidate but under conditions or at a salary level that the particular candidate has indicated would be unacceptable. This looks like a good-faith effort: the candidate was offered the position but turned it down. Chairman Z, having received a refusal from the most qualified candidate, then goes ahead and hires the Anglo male candidate he intended to hire all along—and at a salary higher than that offered to the minority or female candidate.

GOOD-FAITH EFFORT GAME PLAN NO 2. A minority or female candidate is formally listed as the department's second choice after the chairman is certain that the first choice, a white male, will accept the position. This looks good in the recruiting records since it indicates, deceptively, that a minority or female candidate was seriously considered for the position.

GOOD-FAITH EFFORT GAME PLAN NO. 3. The department informally hires an Anglo man by an oral agreement. Subsequently, as an afterthought and to meet the "good-faith" requirement, the department recruits (by advertising in The Chronical of Higher Education) and reviews minority and female candidates. Needless to say, these candidates, cynically recruited after the decision to hire the Anglo man, are turned down since the position is, in fact, no longer open.

GOOD-FAITH EFFORT GAME PLAN NO. 4, OR THE DOUBLE PLAY. A position at University Y is offered to a minority or female professor at University X. The candidate is informed by the department chairman at University X that the offer is not a "real one based on merit but only an affirmative action position to meet requirement." He adds, "For you to accept an affirmative action position would detract from your merit." Thus the minority or female candidate is discouraged from accepting an offer, and the offering institution has a good-faith effort for its records. (You may or may not infer prior contact between the two institutions.)

CHICKEN-HEARTED SCAPEGOATING. Department Chairman Y's former colleague, an Anglo man who is not the most qualified candidate, is let down easily and dishonestly. The Anglo man is not told that he is not the most qualified candidate; he is simply informed that "we had to hire a minority woman." The conclusion that the Anglo man erroneously draws is that he was the most qualified candidate, and that he would have been hired but for the institution's affirmative action policies. The Anglo candidate complains to his professional association that he has been deprived of a position by the implementation of affirmative action.

PROCRASTINATION, OR LET-THEM-WAIT-ANOTHER-300-YEARS. To defeat the recommendation of the faculty committee to offer the position to a female candidate, the department chairman makes the offer but then delays the signing of the contract by the date agreed upon. The female candidate, who has offers with deadlines from other institutions, is thus conveniently forced to remove herself from consideration.

FORKED TONGUE. A Native American with a large educational institution was approached by an acquaintance from another prestigious university who indicated he was on a search committee for an assistant to the vice-president for administration, and wanted to submit the Native American's resume. The Native American replied, "What if I'm not interested?" As they talked, it became clear that the search committee wanted to show that it had approached an appropriate number of minorities, and did not care whether the Native American was, in fact, interested in applying for the prospective position, as long as the resume was circulated among the members of the search committee to show that a "good-faith" effort had been attempted. Even though the Native American did not submit his resume, he had the uneasy feeling that his name had become part of the applicant pool.

Any minority or female candidates who survive these and other ploys and become members of an academic department are then faced with a whole new series of actions that can result in disablement or removal. But that's another story.

Usually search committees of academic departments are not interested in affirmative action recruitment methods. However, in at least one instance the search committee recommended a woman to the department chairman as the best-qualified candidate. When the chairperson of the search committee reported this result, the chairman was heard to respond, "there is no need to hire her, we already have a woman in the department...we have our quota."

#### Unfair Hiring Practices

The stories in academia about unfortunate and unfair hiring practices are endless. The "divide-and-conquer games," playing women against minorities or minorities against women, or different ethnic or racial minorities against each other are common. For example, a department chairman simultaneously promises the same position to women and Chicanos; he promptly steps back and lets both groups fight over it.

Recently, the chairman of a psychology department that is without a woman on the ladder or in tenure position remarked gratuitously to a woman candidate, "I am not a sexist; ask the girls in the office."

The main features of the "old boy" method are subjectivity and cronyism. Its network extends beyond the formal walls of the university; for example, members of external science advisory committees are predominantly white, male, over thirty-five, and are drawn disproportionately from graduate universities. Not surprisingly, their grant awards discriminate against younger researchers and untried approaches in addition to women and minorities. At the same time, these committees perpetuate their biases by long terms of service and the tendency to maintain the entrenched "old boy" network by nominating their personal acquaintances and colleagues to succeed them.

Institutional racism and sexism are complex in institutions of higher learning. Every day too many minorities and women are denied the right to seek and qualify for gainful employment or to improve their job status for "reasons" that deny human dignity and are unrelated to any abilities to perform the work in question. There is a great deal of "sociability testing" involved in getting into the professoriate. Criteria not relating to ability creep into the employment processes at crucial decision points, resulting in a self-perpetuating pattern of homogeneity. The pattern will continue unabated until, in Eric Ashby's words, we "reconcile the intellectual detachment essential for good scholarship with social concern essential for the good life." Then we can begin to address the question: What abilities and qualities are important and do make a difference?

Universities generally admit that they have been less than fair to women and members of minority groups in recruiting, appointing, and promoting them in faculty positions. Before the budget trim and retrenchment there were many promises to right the wrongs of the past. Then and now, most universities labor under the a priori assumption that there are no "qualified" women and minority group members for academic and upper-level administrative positions. If you don't believe that "qualified"

women and minorities exist, then even if they walk into your office you cannot recognize them, much less engage in bold, innovative approaches to their recruitment and hiring. Also implicit is the assumption that if minorities and women are to be employed, the allegedly high standards now in play will be diminished. Both of these specious assumptions are racist and sexist.

It is not merely racism and sexism that oppose affirmative action, but a subtler, more ingrained resistance to recognizing the need for reform. To correct racism and sexism, one must admit that they exist—and in the United States these admissions are not easily made.

### Code Words

On its face, a word or phrase such as "busing," "career education," or "quota" is racially neuter and, of course, has many legitimate uses. In effect, these and other code words are used to mask, distort, and corrupt the democratic processes, and to titillate latent racial hostilities. As Jesse Jackson put it: "It's not the bus, it's us." Code words let whites express feelings without facing them. They say that affirmative action, instead of giving equal consideration to all Americans, seeks "preferential treatment and quotas" for minorities and women. You hear: "We must hire only the most qualified," or "we can't compromise our standards," or "reverse racism." One can comprehend these phrases only with ears attuned by a lifetime of listening to the language of evasive racism and sexism fed by pervasive fear, misunderstanding, and indifference to the reality of full and equal employment in jobs.

Before we get too concerned about discrimination in reverse, we need to deal with the entrenched and pervasive character of race and sex discrimination. James Baldwin observed: "White America remains unable to believe that black America's grievances are real; they are unable to believe this because they cannot face what this fact says about themselves and their country."

The effect of this massive and hostile incomprehension ("the arbitrary quality of thoughtlessness") exacerbates the danger for all of us. The more we look upon each other not as human beings but as dehumanized racial or sexual stereotypes, the more firmly closed each group becomes.

At the heart of the resentment of many women against their present status is the fact that classifications and distinctions based upon sex are not only discriminatory in themselves but also lend institutional support to entrenched practices that ignore women as persons and treat them, consciously or unconsciously, primarily as sex objects or derivative people, not as full persons. All that has been said about the deprivations and frustrations of women applies with special force to minority women, who have been doubly victimized by the twin immoralities of racial bias and sexual bias.

### Elitism

Walter J. Leonard, special assistant to the president of Harvard, asserts that white male faculties seem "absolutely incapable of developing the internal courage or intellectual capacity to accept other than one of their own kind as equal." There is a point at which elitism becomes indistinguishable from racism and sexism.

Racism and sexism refer not only to the bad acts of bad people but also to well-established and entrenched patterns of institutional behavior that are neutral on their face but, intended or not, result in the reinforcement and maintenance of present inequalities stemming from past discrimination. The objective is to assure not only that all Americans play by the same rules but that all Americans play against the same odds.

Perhaps the cruelest aspect of the current cry of "reverse discrimination" is that it ultimately deprives women and members of minority groups of the satisfaction of knowing that they have made it on their own merit. Racism is a system of deadly oppression, both spiritual and physical; that system is not reversed by isolated instances of discrimination against Anglos or by the favoring of one minority over another. Regardless of whether reverse discrimination is wise or unwise, it is impossible for a majority, any majority, to discriminate against itself.

If we are to develop new ideals and grant them some autonomy from our narrow empirical reality, we will have to draw on more diverse cultural, social, economic, and political models than those now provided.

The purpose of affirmative action is to raise standards, not to lower or maintain them. Standards are not only raised by an honest, broad, innovative search that includes all the competent minority and women candidates available, but by the establishment of cultural pluralism in our faculties. The two purposes—increased productivity and greater equality—are inextricably joined.

#### FLAWS AND FALLACIES IN TEXTBOOKS: SOME CORRECTIONS UNDER PRESSURE

by Linn Sennott, associate professor, George Mason University

Letters to publishers concerning sexist examples and illustrations in textbooks can make a difference. Norton Starr, Dept. of Math., Amherst College, tells us the following: "In the September-October, 1977 issue of the AWM Newsletter, I requested support in persuading Prentice-Hall to clean up a potentially valuable but presently sexist book: Flaws and Fallacies in Statistical Thinking, by Stephen Campbell. I am happy to report that such support was forthcoming, and Prentice-Hall has written me that they are taking action. Specifically, they are presently revising the book in question, and they plan to destroy any old stock on hand as of approximately February 1, 1978. This is a rather costly action for them, because they recently, by accident, reprinted the work. Their willingness to make this sacrifice and their speed in responding to a rather brief campaign have both impressed me. It is my understanding that their Mathematics Editor, Harry Gaines, was instrumental in resolving this problem.

Prentice-Hall would not have taken this action without pressure from potential users. I thank those readers of the AWM Newsletter who assisted in this effort."

This paperback deals on an elementary level with common statistical fallacies found in newspapers, magazines, etc. and is excellent in increasing the critical skills of students in liberal arts math courses and statistics courses. Since students in my course found it enjoyable and instructive, I was torn between continuing to use it (with sufficient disclaimers) and not using it. The latter course won out after one too many glances at some of the illustrations. For example, mean, median, and mode are illustrated by having three guys around a table discuss the bust sizes of their latest dates. Although they are fairly well satisfied with a mean of 36" and a median of 37 1/2", one very put-out fellow informs the others that the mode was 30" and he had them both! Those illustrations that include women include them only in a stereotyped way: the nagging 250 pound wife with curlers and a tatoo or the beautiful chick with the mini skirt riding 6" below her navel.

I received a very cordial letter from Harry Gaines, the Mathematics Editor at Prentice-Hall, inviting me to critique the proposed replacement cartoons. I thought they were all acceptable, but noticed that with these cartoons in place, there would be approximately 53 drawings of men throughout the book, and only 6 of women. Truly the invisible 50%+ of the population! I suggested that some of the "average" men doing regular things, like driving a car, could be replaced by "average" women doing those same regular things. While it would be preferable to make a few more extensive textual changes (for example, on page 129 there is a lengthy discussion the gist of which is that a freaky looking woman is more likely to study statistics), I think that with the replacement cartoons and a few minor textual changes, the book will be much improved. You can order a copy from Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632. (The new edition should be available in June.)

If enough interest is shown, I'm hoping that this column can be a regular (or irregular) feature of the Newsletter. I would appreciate receiving copies of letters concerning sexist textbooks you may send to authors or publishers. If you are too busy to write, you could just drop me a line with the textbook title, publisher, and pages on which the offensive material occurs. My address: Dr. Linn Sennott, Dept. of Math., George Mason Univ., Fairfax, Va. 22030, Tel: 703-323-2262.

## DATA ON WOMEN IN SCIENTIFIC RESEARCH: Part One

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

### INTRODUCTION

The problem posed for this research was to delineate the characteristics and activities of women scientists and engineers engaged in research, both in comparison to other women scientists and engineers and to men engaged in research, by examining and analyzing all available data. Further, an effort to view changes over time in these characteristics was included in the problem, in order to examine the progress of women in science and engineering research, whether that progress was forward or backward. One additional task was to try to see whether minority women differed from majority women scientists and engineers who were engaged in research.

It became almost immediately evident that the available data base is inadequate to study the problem as outlined. Where information is available by sex, few of the characteristics needed for this analysis have been tabulated. Where information exists delineating research scientists and engineers from those performing other activities, data are rarely available by sex. Difference in minority and majority women researchers cannot be illuminated, because no data exist to provide such differentiation.

Thus, the research takes on the characteristics of a double jigsaw puzzle from which a third picture must emerge. The first puzzle shows a picture of scientists and engineers involved in research, including a background showing their employment setting, with the individuals pictured as sexless. The second puzzle is a picture of women scientists and engineers with most of the pieces missing that might have shown their activities in various settings. We can count the numbers, but where the setting is evident, we cannot see what most of these women are doing; and where we can see their activity, we cannot tell where it is taking place.

Some pieces are missing in both puzzles, and a few pieces are congruent to both puzzles. The picture to be made by the research, thus, not only must surmise the characteristics of some of the missing pieces from the information available, but ultimately leaves large holes where no information is available to fill in the spaces.

The attempt to view changes over time generally encompasses only a short time interval, since comparable data over long time periods exist for only a few variables, none of them directly related to women scientists and engineers who are engaged in research.

### Data Sources and Reliability

The vast majority of the data available on scientists and engineers working in research is collected by or for the National Science Foundation. Data by sex that deals with the doctoral population is more detailed and more reliable than data by sex from other surveys done by or for NSF, since the sample used to study the characteristics of the doctorate population was carefully selected to include a sufficient proportion of women to provide validity when data are broken out by sex. Other samples, such as the National Sample used by the National Science Foundation as part of its Manpower Characteristics System, were selected at an earlier point in time without regard to appropriate sample size of women to provide data by sex. The proportion of all scientists and engineers who are women is small. Thus, samples that do not include larger numbers of women than their proportion in the total introduce a significant sampling error when specific characteristics are broken out by sex.

Except for surveys of the doctorate population, which will continue to maintain a carefully weighted sample to provide data on men and women separately, no major change in most of the samples used for continuing series surveys of the science and engineering population will be possible prior to the 1980 Census. When the National Sample for the next decade is selected, a special effort should be made to insure a sufficient number of women in the sample to allow detailed statistical analysis by sex.

In part because sample sizes for women in science and engineering are small, and in part because a demonstrated need sufficient to warrant the extra cost of

collecting, tabulating and analyzing more data has not been recognized by these agencies, much data collected by and for NSF and other government agencies which includes gender identification is never tabulated by sex. Thus, demographic variables which may be significantly different for otherwise comparable men and women scientists and engineers are neither noted nor evaluated.

The questionnaires used for surveys of total populations (such as employment of scientists and engineers by academic institutions) often do not include request by sex of those variables which can be cross tabulated to provide an understanding of the data results. For example, the finding of this study that a higher proportion of women scientists and engineers is employed in succeeding higher groups of universities employing scientists and engineers cannot be explained satisfactorily because no information was requested by sex on degree level, academic rank or such fringe indicators as salary of these scientists and engineers. Information on academic faculty by field, rank, type of institution and sex is not available for cross checking.

In some cases where the sex variable was requested by the survey instrument, cross tabulations of other variables by sex were not made because the female proportion in the sample for any particular variable was too small to provide reliable data. For example, the number of women scientists and engineers employed in industry is so small that the standard samples of this population, unaugmented by oversampling for women, cannot be further delineated by principal activity, by degree level or other such variables because such tabulations would produce data cells too small to be weighted reliably.

Data collection and analysis is expensive - and the analysis grows more expensive and time consuming with each additional variable analyzed or cross-tabulated. Partly for this reason, many of the surveys used in this study did not request or did not analyze the variables needed for this particular research.

Thus, because the sample base for women is too small, because the agencies have not recognized a need for more detailed data delineating women from men, and because the cost of collecting and analyzing more data has not been justified, the data base for studying the characteristics of women scientists and engineers in relation to men and in relation to similar women in other fields is inadequate; the data base necessary to study that particular segment of women scientists and engineers working in research is almost non-existent.

#### Definitions of "Research"

Data presented in this paper may or may not use the same definitions for "research," "basic research," "applied research," "development," and "management of R & D" from one source to another. Further, available information comes from different sources - e.g. individual scientists and engineers, academic departments or employers - and is not, therefore, strictly comparable. For purposes of this paper, no attempt has been made to differentiate definitions in one questionnaire from those in another or to indicate those where no definition is given. The words regarding research have been assumed to have common definitions, commonly understood and accepted by employers of scientists and engineers, by scientists and engineers themselves, and by the readers of this paper. To have taken any one set of definitions from any single data source and been bound by them would have made comparison with other data impossible.

#### Organization of the Study

This paper will examine some of the findings of pertinent reports, indicating the nature of the "jigsaw puzzles" and the kinds of assumptions that are made to provide some delineation of the characteristics of women scientists and engineers performing research. It then looks specifically at data on women employed in academic institutions, and in industry, with some sample data about women employed in government. A short section on minority women indicates how small a group this is and how little is known about these women relative to others.

Some changes over time are shown for the periods where comparable data exist, including a discussion of salaries as a fringe indicator of the status of women scientists and engineers.

Available data on the labor force participation of women scientists and engineers is examined and questioned, and findings are summarized.

The tables in this report include both numbers and percentages of women in various facets of science and engineering shown over time, because in some instances the numbers are essential to indicate how small and thus how unreliable some of the data cells are. The interpretation of the tables is in the text.

Recommendations regarding future data collection are incorporated at the end of the summary of findings.

#### WOMEN HONORED

Dr. Elizabeth H. Cuthill, the Numerical Analysis Coordinator for the Computation, Mathematics, and Logistics Department of the David W. Taylor Naval Ship R&D Center (DTNSRDC), Bethesda, Maryland, recently received the David W. Taylor Award for Scientific Achievement for the calendar year 1976. The DTNSRDC Commander presented the Award to Dr. Cuthill, citing her "outstanding personal contributions and technical leadership". Reviewing her accomplishments he praised her "technical excellence and expertise of the highest order, scientific productivity addressed to Navy applications of major significance, and an ability to motivate and lead colleagues and subordinates."

Dr. Cuthill is the author of many papers on mathematical and computational techniques. A leader in exploiting the use of computers for symbolic mathematics, she is presently engaged in making this capability available to the entire Navy laboratory community.

from the York Alumni Communique May 1977 with permission

Alice Turner, professor of mathematics at York University (Downsview, Ontario, Canada), was awarded the degree of Doctor of Laws (honoris causa) in June, 1977. Canada has had even fewer women mathematicians, proportionately, than the U.S. After completing her Ph.D. in mathematics at the University of Toronto in 1932, she found it difficult to find employment because of the depression and her sex. She worked as a statistician for the Dominion Bureau of Statistics for three years and for a brokerage firm from 1937-1960. Between 1937 and 1960, she published various articles. Her name was often omitted from her publications which were instead attributed to her publishers. In 1937, she became an honorary member of the F.S.S. (Fellow Royal Statistical Society), a prestigious position. In 1960, she became a Special Lecturer at York. An assistant professor from 1961-1964, she became a full professor, a survivor, a remarkable woman.

#### JOB REGISTER

The AWM has a job registry which sends to the participants all notices of jobs which AWM receives. In order to participate you must be a member of AWM and send stamped self-addressed envelopes to the AWM office - c/o Department of Mathematics, Wellesley College, Wellesley, Massachusetts 02181. If you have any comments about the registry send them to Judy Green, 10106 Leder Road, Silver Spring, Maryland 20902.

#### CORRECTION

The heading of the second column of figures on page 3 of the last newsletter should be "Percentage of tenured women on faculty".

CHARLOTTE ANGUS SCOTT, part 2 of 2

by Pat Kenschaft, AWM council member.

Charlotte Scott was the first chairman of the mathematics department at Bryn Mawr College. She held this position from 1885 until she retired in 1925. She accepted the challenge of training young, superior mathematicians with zest. Every two or three years from 1894 until her retirement a young woman would earn a doctorate under Dr. Scott's supervision. Each of these students spent at least one year of her graduate program at some mathematical center in Europe due to Dr. Scott's skill in obtaining grants for them and because of Scott's dedication to making the U.S. mathematical community equal to any in the world.

Isabel Maddison, who received her doctorate under Dr. Scott's supervision in 1896 and later joined the mathematics faculty at Bryn Mawr, wrote: "Professor Scott was an extraordinarily good teacher. She has the rare gift of lucid explanation combined with an intuitive perception of just what the student could grasp so that she never bored by being too easy or discouraged by being too difficult. Nor did she spare any effort to help a stupid student who really tried, though she was ruthless with the lazy or casual."

There were, of course, students with reservations. A copybook contains the following ditty: "S is for Scott/Superior Scott/She is kind in the main/If you have any brain/But when you have not--/Superior Scott." In contrast, Scott's letters reveal sympathy for the problems of students. One, lamenting that she cannot recommend a student for further graduate study says, "...in every particular save the one essential, that of capacity, she is all that I could possibly wish." Another pleads for seven pages on behalf of a student abruptly dismissed because of a serious illness, arguing that her physical infirmity makes intellectual work all the more important and that it is cruel to heap one tragedy upon another.

She also produced a continual stream of research papers. Her specialty was the study of specific algebraic curves of degree higher than two. According to F. S. Maclaulay, "A favorite topic of Miss Scott's was higher singularities, on which she wrote several papers. The subject is abstruse, and not widely and completely known....." Readers who want further information about her research may find Maclaulay's paper on pages 230-40 in the July 1932 issue of the JOURNAL OF THE LONDON MATHEMATICAL SOCIETY.

We may guess that Charlotte Scott found her experience in the New World rather lonely; evidence includes the fact that she retained her church membership in England for over a decade after she came to America and the knowledge that when she retired, she immediately bought a house in Cambridge, never to return to the U.S. again. A biography of Martha Carey Thomas, first dean and soon the second president of Bryn Mawr College, reports that Professor Scott found it "a source of bewilderment and some resentment" that she was not encouraged to drop in at Dr. Thomas' office for "friendly gossip." The letters between these two women, only a year apart in age, reflect a noticeable lack of warmth. Her last doctoral student, Marguerite Lehr (now herself retired from a distinguished career on the Bryn Mawr mathematics faculty) reports that "she was always extremely kind to me, but I never would have dreamed of asking her anything personal." When she moved into a house in 1897, she persuaded a cousin to cross the Atlantic and take care of the house for her; the cousin presumably provided companionship also.

In 1904 Dr. Scott had a severe attack of rheumatoid arthritis, and from then on her unpredictable health and increasing deafness were extreme frustrations. However, Dr. Lehr remembers that in her last years at Bryn Mawr she could lecture "perfectly well" despite being almost totally deaf. She depended on graduate students to answer the undergraduates' questions.

Her doctor recommended increased out-of-door exercise. This was a novel idea to women of her generation, but even at Girton she had helped introduce lawn tennis for women. Now in her middle years, she took golf lessons and became a "very fair player." She also turned to the traditional British activity of gardening. Dr. Lehr wrote, "for many... Dr. Scott's name will bring a vivid picture of a garden, brought year after year, unbelievably, to greater beauty -- a garden that showed

the massed scarlet and lavender blue of poppies and Canadian phlox in the spring and flamed crimson and orange till the frost took the last chrysanthemum from the slope above the hockey field." She won a prize for a new variety of chrysanthemum she developed.

Some historians of Bryn Mawr College have said that her influence on that institution is second only to that of M. Cary Thomas. Dr. Scott served on innumerable committees and boards. She was involved in such varied matters as faculty selection, student admission standards, arrangements for the entrance exams, mathematical prerequisites, course offerings, allotment and size of library holdings, decisions regarding public health and student social behavior, and a heated debate as to exactly where a foot path should cross the campus. She argued especially firmly for funding an ample mathematics library with a steady supply of current journals.

She also played a role in the growth of the American mathematical community. She made almost annual pilgrimages to Europe, attending international mathematical meetings, placing her graduate students, and persuading leading mathematicians to visit (and sometimes move to) the United States. She recruited a second mathematician from Cambridge for the Bryn Mawr faculty in 1887 and a third in 1903. In 1900 she attended the International Congress of Mathematicians in Paris and wrote a 22-page report which appeared in the BULLETIN of the A.M.S. She persuaded a young couple, Bertrand and Alys Russell, then not widely-known, to visit the United States in 1896 and to spend a few weeks lecturing at Bryn Mawr. "With their markedly unconventional statements, radical theories, and probing questions, they set the college, and in particular, the trustees, by the ears."

In 1922 her former students arranged a dinner in her honor on the Bryn Mawr campus. Over 200 people attended, many traveling long distances to give a brief speech of recognition. Professor Alfred Whitehead made a special trip to the U.S. to attend. A small quote from his featured speech provides an appropriate conclusion to this article.

"A friendship of peoples is the outcome of personal relations. A life's work such as that of Professor Charlotte Angus Scott is worth more to the world than many anxious efforts of diplomatists. She is a great example of the universal brotherhood of civilization."

#### Partial list of Charlotte Scott's publications:

1. Modern analytical geometry (Macmillan, 1894) pp. 1-288
2. Cartesian Plane Geometry, J.M. Dent and Company
3. "The binomial equation  $x^p-1=0$ ", Amer. J of Math, 8 (1886) 261-264
4. "Higher singularities of plane curves", Amer. J. of Math, 14, (1892) 301-325
5. "The nature and effect of singularities of plane algebraic curves", Amer. J. Math, 15 (1893), 221-243
6. "On plane cubics", Phil. Trans. (A), 185 (1894) 247-277
7. "Note on adjoint curves", Quart. J. of Math, 28 (1896) 377-381
8. "Sur la transformation des courbes planes", Ass. Franc. C.R., Pt. 2 (1897), 50-59
9. "On Cayley's theory of the absolute", B.A.M.S. 3 (1897), 235-246
- 10-11. "Studies in the transformation of plane algebraic curves", Pt. I, Quart. J. of Math, 29 (1898), 329-381; Part II, ibid., 32 (1901), 309-339
12. "A Proof of Noether's fundamental theorem", Math. Annalen, 52 (1899), 592-597
13. "The status of imaginaries in pure geometry", B.A.M.S. 6, (1900), 163-168
14. Report on the International Congress of Mathematicians in Paris, B.A.M.S. 7 (1900), 57-79
15. "On a recent method for dealing with the intersections of plane curves", T.A.M.S., 3 (1902), 216-263
16. "Elementary treatment of conics by means of the regulus", B.A.M.S. 12 (1905, 1-7
17. "Note on regular polygons", B.A.M.S. (1906)
18. "Higher singularities of plane algebraic curves", Proc. Camb. Phil. Soc., 23 (1926) 206-232

*From April, '78-AWM Newsletter*

by Judy Green, AWM co-vice president

This contains the substance of a talk given at the Special Session on History of Mathematics at the January 1978 meeting of the American Mathematics Society. A paper about women who received Ph.D.'s in mathematics before 1940 is being prepared by the author and Jeanne Laduke.

D. E. Smith and J. Ginsburg in "A History of Mathematics in America before 1900" note that the Mathematische Annalen contain fifteen articles by Americans in the years 1893-1897. They list the authors of fourteen of these articles - all men. The fifteenth was by Mary Frances Winston, an American student of Felix Klein who, together with Grace Chisolm of England and Margaret Maltby an American physics student, became in 1893 the first women to study at a Prussian university. The paper by Mary Winston was not her thesis (she completed it a year later in June 1896 one year after Grace Chisolm completed hers) but an expansion of a talk she had given in the Mathematics Seminary at Göttingen. She had in fact been the first woman to present such a talk and did so less than three months after arriving in Germany. She wrote of that presentation that "it went off reasonably well... I do not think that anyone will draw the conclusion from it that women cannot learn Mathematics."

The following list of American women receiving doctorates in mathematics shows that during a period of twenty five years from the first such award women not only could but did learn and do mathematics.

1886	Winifred <u>Edgerton</u> Merrill**	Columbia
1894	Annie <u>MacKennon</u> Fitch	Cornell
1895	Charlotte Cynthia <u>Barnum</u>	Yale
	Agnes Sime <u>Baxter</u> Hill	Cornell
1896	Elizabeth Street <u>Dickerman</u>	Yale
	Ruth <u>Gentry</u>	Bryn Mawr
	Isabel <u>Maddison</u>	Bryn Mawr
1897	Mary Frances <u>Winston</u> Newson	Göttingen
1899	Leona May <u>Peirce</u>	Yale
1900	Ann L. <u>Bosworth</u> Focke	Göttingen
1901	Grace <u>Andrews</u>	Columbia
	Emilie Norton <u>Martin</u>	Bryn Mawr
	Charlotte Elvira <u>Pengra</u> Crathorne	Wisconsin
	Roxana Haywood <u>Vivian</u>	Pennsylvania
	Ruth Goulding <u>Wood</u>	Yale
1903	Helen Abbot <u>Merrill</u>	Yale
1904	Virginia <u>Ragsdale</u>	Bryn Mawr
	Clara Eliza <u>Smith</u>	Yale
1905	Emily Matilda <u>Coddington</u>	Columbia
	Alice Madeleine <u>McKelden</u> Dimick	Pennsylvania
1907	Florence Eliza <u>Allen</u>	Wisconsin
1908	Elizabeth Buchanan <u>Cowley</u>	Columbia
	Mary Emily <u>Sinclair</u>	Chicago
	Anna Lavinia <u>VanBenschoten</u>	Cornell
	Euphemia Richardson <u>Worthington</u>	Yale
1909	Grace Marie <u>Bareis</u>	Ohio State
	Mary Shore <u>Walker</u> Hull	Yale
1910	Elizabeth Ruth <u>Bennett</u> Grennan	Illinois
	Helen Brewster <u>Owens</u>	Cornell
	Anna Johnson <u>Pell</u> Wheeler	Chicago
	Marion Ballantyne <u>White</u>	Chicago
1911	Clara Lattimer <u>Bacon</u>	Johns Hopkins
	Ida <u>Barney</u>	Yale
	Anne Dale <u>Biddle</u> Andrews	California

\*\* The underlined name is the surname under which the degree was granted.

Two names which might also be included on such a list are Christine Ladd Franklin and Charlotte Scott. The former, as Christine Ladd, was actually the first American woman to earn a doctorate in mathematics. This she did at Johns Hopkins in 1882. However, even though Sylvester encouraged her to enroll and she was given a fellowship to study from 1879 until 1882, Hopkins would not award her a doctorate simply because she was not male. It did award a Ph.D. in mathematics to a woman in 1911 but not until 1926, forty-four years late, did it award one to Christine Ladd Franklin. Although her main work was in optics and she eventually taught psychology as well as logic at Hopkins and then at Columbia, Christine Ladd Franklin continued her interest in mathematics. In 1893 she met the University of Chicago graduate student Mary Winston at Felix Klein's Evanston colloquium; hearing that the younger woman wanted to study in Europe, she offered her a scholarship which allowed her to go.

Charlotte Scott was not included on the list because she did not come to America until after she had received her doctorate from the University of London in 1885. However, almost immediately upon receiving the degree she came to Bryn Mawr where she started a graduate program in mathematics and where she spent her entire career. She served on the first Council of the American Mathematical Society, was the AMS's only female Vice-President until 1976 and was a cooperating editor of the American Journal of Mathematics.

There were actually more women mathematicians trained during this period than are listed. Fellowships were not often available (especially for women) so there were a significant number of women who took many years to receive their doctorates. For example there were at least five women who received their bachelors degrees before 1900 and took between fifteen and twenty-five years to complete a doctorate.

In considering the later lives of the women on the above list it is striking that only twelve of them married and only two of those had essentially continuous careers: Anne Biddle Andrews, an instructor at the University of California, and Anna Pell Wheller, probably the best known research mathematician of the group. The only woman ever to give the AMS colloquium lectures, she was a member of the Council of the AMS and was awarded honorary doctor of science degrees from the New Jersey College for Women and from Mt. Holyoke.

One other woman, Helen Brewster Owens, finally did gain employment after many years of being jobless because of nepotism rules. During her period of unemployment she was very active in the woman's suffrage movement and was probably the first person to collect information on women in mathematics. In 1936 she formed the Committee for the Study of Women's Work in Mathematics and, in preparation for a luncheon honoring women who received their doctorates before 1900 or who were professor emeriti, collected career information from women mathematicians. The questionnaires which she collected in 1936 and again in 1940 are now in the Schlesinger Library at Radcliffe College as is the paper she delivered at that luncheon - Early Scientific Work of Women and Women in Mathematics.

Two others had their careers interrupted by marriage but resumed them later. One was Mary Winston who gave up a full professorship at Kansas State Agricultural College to marry Henry Newson, a mathematician at the University of Kansas. Before having children she taught a few courses at Kansas (there is no mention of this in Price's "History of the Department of Mathematics at the University of Kansas") and while she was the mother of one child and pregnant with a second, Henry Seely White asked her (with Hilbert's approval) to translate Hilbert's famous problems speech given to the 1900 International Congress at Paris. Her translation appeared in the Bulletin of the AMS and is still the standard English source for this paper. Eight years later she was widowed and left without a pension. She was not then hired by the University of Kansas even though there were positions to be filled, nor was she hired a few years later when she was actively seeking employment. The rest of her career, until 1942, Mary Winston Newson taught at small colleges in the midwest.

The other whose career was interrupted was Winifred Edgerton Merrill, the first American woman to be awarded a doctorate in mathematics. She was in fact the first woman to receive a doctorate from Columbia in any subject. However unlike Mary Winston whose husband encouraged her to take herself seriously as a mathematician, Winifred Edgerton was obliged to resign from the original Board of Trustees of Barnard College

because her conservative husband objected to her attendance at meetings. She eventually did serve as principal of a private girl's school but probably not until about the time of her husband's death.

Of the remaining seven married women, five gave up teaching careers either upon marriage or shortly thereafter. The other two never pursued careers.

Of the women who had college teaching careers, ten were at women's colleges. All of these women attained the rank of full professor. Of the remaining eight college faculty members only Mary Winston Newson and Mary Sinclair, of Eureka College and Oberlin College respectively, attained that rank. One, Marion Ballantyne White, was promoted to associate professor at Carleton College twenty years after receiving her doctorate and twelve years after coming to Carleton. The five others were all assistant professors or instructors throughout their careers. They include: Anne Biddle Andrews who spent eighteen years at the University of California at Berkeley, the last ten as an instructor; Helen Owens who was finally hired by Penn State in the early 1940's and retired about 1950 as an assistant professor; Euphemia Worthington, an assistant professor at UCLA for twenty-seven years; Grace Bareis, an assistant professor at Ohio State for thirty-eight years; and Florence Allen, an instructor at Wisconsin for forty-four years.

Six other women had miscellaneous and varied careers including a research astronomer at Yale, an administrator at Bryn Mawr and the head of a chain of music stores in New England.

Only one of the women, **Emily Coddington**, remains a complete mystery.

The IPN Institute (Institutum Philosophiae Naturalis), a non-profit research institute, has been formed to encourage theoretical and epistemological inquiries in the physical, natural and social sciences, which because of their unusual scope or method cannot be adequately supported within the confines of a single scientific discipline or traditional funding source. Primarily, the Institute's efforts will take the form of support for research projects, the organization of seminars, and the publication (where warranted) of the results of such work. Inquiries may be sent to IPN Institute, 20 Nassau Street, Suite 240, Princeton, NJ 08540.

#### LETTER TO THE EDITOR

To the editor,

A pleasure that comes our way far too rarely is to note books, articles or reviews which dispel the myths accepted widely in North America concerning mathematical history, myths which fortify the racism so important to North America's rulers. The current issue of FREEDOMWAYS (vol. 17, no. 2, 1977), the quarterly review of the freedom movement founded by the legendary Dr. W. E. B. DuBois, carries reviews of two books of great value in this sector of the struggle against racism. The reviews are of great interest in themselves and are found on pp. 110-114; their common author is Beatrice Lumpkin who teaches mathematics at Malcolm X College in Chicago and whose specialty is early mathematics in Africa and Asia. (Those interested in obtaining this issue can do so by addressing the magazine at 799 Broadway, New York, NY 10003, and sending \$1.25 for the single issue or \$4.50 for an annual subscription.

The books she reviews are Mathematics in the Time of the Pharaohs, by Richard J. Gillings, MIT Press, \$25, and Africa Counts, by Claudia Zaslavsky, Prindle, Weber and Schmidt, \$13.50. Their titles are sufficient to indicate their potential usefulness. The reviews demonstrate the considerable extent to which they achieve their potential.

Lee Lorch, Math. Dept., York University

#### SIAM MEETING IN ALBUQUERQUE

by Harriet Kagiwada, AWM Council member representing applied math, president of HFS Associates

The fall meeting of SIAM (Society for Industrial and Applied Mathematics) was held in Albuquerque, New Mexico on Oct. 31, Nov. 1 and 2, 1977. Cleve Moller and Mel Scott were co-chairmen of the meeting which was attended by 369 people. There were 113 speakers and numerous poster sessions on control theory, resources, flows, numerical analysis, PDE's, integral equations, and other topics. One of the highlights of the sessions was the presentation of image processing by Harry Andrew and Ed Angle.

Though no figures are available, there were perhaps a dozen women in attendance, several of whom presented papers. I delivered an invited lecture on "Extensions of the Sobolev-Bellman-Krein Equation for the Fredholm Resolvent," in which I presented a current summary of Integral equation theory, methods and applications.

The spring meeting will be held at the University of Wisconsin-Madison on May 24-26, 1978. Those interested in the meeting or in joining SIAM may write to SIAM headquarters at 33 S. 17th Street, Philadelphia, PA 19103. It would be good to see more women mathematicians in SIAM.

#### NOTE FROM THE EDITOR

This is the first issue of the 1978 volume. The month on the cover is being changed to mailing month. Deadlines for the fall will be changed to get issues to members before the AMS election and before the January meeting, if AMS deadlines permit. The next deadlines are May 8 for copy, May 15 for ads.

## JOBS

Institutional members of AWM receive two free ads per year. All other ads are \$5.00 a piece and must be prepaid. The vacancies listed below appear in alphabetical order by state. All institutions advertising below are Affirmative Action/Equal Opportunity employers.

Univ. California, Santa Barbara Senior faculty position in Mech and Environmental Engineering. Teach undergrad and grad classes in mech. eng. and related ocean engineering areas. Strong background in mech. eng. and modern ocean eng. req'd. PhD req'd. Apply to Prof. R.S.Hickman, Chairman, Dept Mechanical & Environmental Engineering, Univ. California, Santa Barbara, CA 93106, thru 5/31/78.

Calif. State Univ., Chico, Visiting Asso. or Full Prof. 1 semester or yr; \$17,900-\$27,300/yr; \$8,950-\$13,650/sem. Duties: teach 1 lower div. course, 1 upper div. and seminar for faculty and adv. students. Phone or write Dr. Neil C. Schwertman, Chair. Math Dept., California State Univ., Chico, Chico, CA. 95929, Phone (916) 895-6111.

Calif. State Univ., Chico, (1) Tenure track Asst. Prof., PhD plus 1 yr full time teaching exp. Coordinate remedial math prog. 12 unit teach. load: undergrad math and/or statistics. (2) 3 yr visiting Asst. Prof., PhD plus 1 yr full time teach exp. 12 unit teach. load: undergrad math and/or statistics. Both start Aug. 22, '78. M.S. or M.A. considered if exp. and training equivalent to PhD \$14,200-\$17,100. Apr 30 deadline. Send resume or phone: Dr. Neil C. Schwertman, Chair., Math Dept., California State Univ. Chico, Chico, CA 95929, Phone (916) 895-6111.

Howard Univ., possibility of 2 full-time asst. professorships for Aug. '78. Send inquiries to James A. Donaldson, Dept of Math, Howard Univ. Washington, D.C. 20059.

Univ. of Iowa, 1 or 2 tenure-track positions beg. Aug '78. Add'l visiting positions a possibility Preference given in areas of topology and applied analysis. PhD req'd. Criteria: ability and potential in research and teaching. Send vita and bibliography plus 3 letters of recommendation Faculty Selection Committee, Dept of Math, Univ. of Iowa, Iowa City, Iowa 52242.

Wellesley College anticipates 1 or 2 openings for Sept '78. (1) Senior appt to teach pure and applied math; possible joint appt in Computer Science. Evidence of excellent teach. and strong research record req'd. Salary dependent on rank and experience. (2) Asst. Prof. with salary at least \$14,000. Evidence that Ph.D. will be completed by Sept req'd. Teach load for either position approx 8 hrs per week. Contact Chairman, Math Dept., Wellesley College, Wellesley MA 02181

M.I.T. One or two vacancies for Inst. or Asst. Prof. in statistics expected in Fall '78. PhD in statistics preferred. Write: H.Chernoff, Math Dept., Mass. Institute of Technology, Cambridge, MA 02139

Western Michigan Univ. 4-Asst. Professorships, 2 in Computer Science, 1 each in Math and Statistics. Start 8/28/78. PhD req'd. Contact Dr. James H. Powell, Chairman, Dept of Math, Western Michigan Univ., Kalamazoo, MI 49008.

Dartmouth College, Asst. Prof., Initial 3-yr appoint & tenure. Excellent in research plus strong interest & ability in teaching. PhD in math or statistics req'd. Write: Prof R.Crowell, Chair., Math Dept., Dartmouth College, Hanover, NH 03755.

State Univ. of N.Y., Buffalo, Asst Prof. Fall '78. Undergrad teach. exp. req'd with high research potential. Apply: Dr. A. MacGillivray, Chair., Math Dept., SUNY at Buffalo, 106 Diefendorf Hall, Buffalo, NY 14214.

State Univ. of N.Y. at Buffalo, 2 senior appoint. beg. Fall '78. Applications invited in all fields, particularly logic, combinatorics or other areas of applied math. Apply to Dr. A. Dean MacGillivray, Chair, Dept of Math., SUNY at Buffalo, Diefendorf Hall, Buffalo, NY 14214.

State Univ. of N.Y., Buffalo, 2 Instructorships pending budget in applied math and pure math, 2 yr appt. \$16,200 for 12 mos beg Sept '78. Teach. load 2 one sem. courses. PhD req'd. Applications and supporting letters sent to Dr.A. Dean MacGillivray Chair., Math Dept. 106 Diefendorf Hall, Buffalo, N.Y. 14214.

State Univ. of N.Y., Fredonia, 2 Asst. Prof positions. Salary competitive; start Aug.'78. PhD and ability to teach intermed. level Computer Science courses preferred. Contact: Dr. J.E.McKenna, Act. Chair., Math Dept., SUNY College at Fredonia, NY 14063.

Vassar College, Computer Science, Asst. Prof. 3 yr appoint. on tenure-track position, beg. Fall '78. PhD req'd. PhD candidate considered for contingency appointment. Requirements: ability to teach FORTRAN or PL/I; interest in developing courses on computer. Teach. load: approx. 9 hrs/wk. Salary: \$12,500-\$13,750. Liberal fringe benefits. Send vita, 3 references to Prof. Winifred Asprey, Director of Computer Center, Vassar College, Poughkeepsie, NY 12601. April 15 deadline.

Ohio State Univ., Chairman, Math Dept. Position available 1/1/79, duties could be assumed as late as 9/1/79. Candidates should possess demonstrated leadership, distinguished scholarly achievement, adm. potential and appreciate the role of math research and teach. at a large state univ. Send vita and 3 references to Prof. Alan C. Woods, Search Committee Chair., The Ohio State University, Columbus, OH. 43210.

Ohio State Univ. tenure track Asso or Asst. Prof. Significant research accomp. and successful teach experience. Preference given to those working in Automorphic forms and representation theory, especially number theory and Lie Theory. Send info and resumes to Prof Joseph Landin, Math Dept., 231 W. 18th Ave., Columbus, OH 43210.

Ohio State Univ. invites applications for several anticipated tenure-track positions on its regional campuses, located at Lima, Mansfield, Marion and Newark, provide instruction in math at freshman and sophomore levels. Rank of Asst. Prof. PhD req'd. Send resume and letters of recommendation to John Riner, Vice Chairman, Math Dept, The Ohio State Univ., 231 W. 18th Ave., Columbus, OH 43210.

Ohio State Univ. anticipates position to be filled by a distinguished mathematician. Recognized leadership, outstand. research accomplishment and ability to enhance instructional program would be expected of serious candidates. Inquiries from Algebraic Topologists are especially invited. Send resumes to Prof. Joseph Landin, Math Dept. 231 W. 18th Ave., Columbus, OH 43210.

Reed College, Asst. Prof. 2 yr opening beg. Sept '78. Salary abt. \$13,590 Fringe benefits add approx. 15% of base salary. Apply to John D. Leadley, Chair., Search Committee, Dept of Math., Reed College, Portland, Oregon 97202.

Carnegie-Mellon Univ., Asst. Prof in applied math. Special attention given to candidates in numerical analysis and optimization; joint appointments with other Depts. are possible. Require excellence in teach. and breadth to develop and teach courses in diverse areas of applied math. Strong research potential. Write Prof. George J. Fix, Head, Math Dept., Carnegie-Mellon Univ., Pittsburgh, PA 15213.

Mansfield State College, Instructor, temp. full-time for academic year '78-'79 only. PhD pref., Masters accepted. Teach 4 sections of undergrad. courses requiring no more than 3 preparations. Salary \$11,000-\$15,000 Instructor or Asst Prof. depending on qualifications. Deadline 4/15/78. Apply to Prof Wellington C. Engel, Dept of Math, Mansfield State College, Mansfield, PA 16933.

Univ. Pennsylvania, Asst. or Asso Prof. beg. Sept '78. PhD in statistics with solid foundation in theory req'd, plus strong interest in applications. Contact: Prof. J.S. DeCani, Cahir, Statistics Dept. E-200 Dietrich Hall/CC, Univ. Penn., Philadelphia, PA 19104.

Univ. of Wisconsin-Madison, Limited no. of visiting research appts. at postdoctoral level and up; 1 yr or less beg in Sept., but dates negotiable. Should have keen interest and demonstrated competence or promise in applied or applicable math. Submit application at least 6 mos. before desired starting date; most positions are filled by 4/15. Write to Prof. Ben Noble, Director, Math Research Center, Univ. of Wisconsin-Madison, Madison, WI. 53706.

Univ. of Toronto, Prof., Teach grad and undergrad courses. Direction of PhD theses and maintain high standard of research in the Dept. Salary negotiable. Date of appointment 7/1/78. Apply to: The Chairman, Dept of Math, Univ. of Toronto, Toronto, Canada, M5S 1A1.

Univ. of Toronto, Asst Prof/Statistics, St. George and/or Erindale College campuses. Beg. 7/1/78. PhD and evidence of excellence in teach. and research req'd. Apply to Chairman, Dept of Math., Univ. of Toronto, Toronto, Canada M5S 1A1.

Univ. of Toronto, Asst Prof., tenure-stream appointments in math, applied math or history of math. Start 7/1/78. PhD and evidence of excellence in teach and research req'd. Send vita to Chairman, Dept of Math, Univ. of Toronto, Toronto, Canada, M5S 1A1.

Univ. of Winnipeg, Possible 1 yr sabbatical replacement, teach statistics at undergrad level. PhD and teach. experience preferred. Salary commensurate with qualifications and experience. Apply to Prof. W.C. Campbell, Chair., Math Dept. Univ. of Winnipeg, 515 Portage Ave., Winnipeg, Manitoba. R3B 2E9.

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