

Association for Women in Mathematics

Volume 17, Number 6

NEWSLETTER

November-December 1987

CONGRATULATIONS TO LIDA BARRETT, PRESIDENT-ELECT OF THE MAA

PRESIDENT'S REPORT

This is the only *Newsletter* between the Summer and Winter meetings, so there is much to report of activities past and future. I appreciate your response to my request for information about programs, departments and individuals you deem exemplary for some reason. The first such article, "Remembering Alice Dickinson," was written by my good friend Joan Hutchinson and appears in this *Newsletter*. In future reports, I shall discuss other messages I have received.

Salt Lake City. The joint meetings in this serene city were the quietest in my memory, but provided a welcome opportunity to meet members old and new. The AWM Panel on Gender and Science was excellent. Martha K. Smith, moderator, and panelists Mary Beth Ruskai and Patricia Kenschaft offered their insights and criticism of current research on the interplay between gender and science (much of which is done by people who are not scientists), as well as reasons for the relatively small number of women in mathematics. You may read for yourselves the proceedings of the panel in this *Newsletter*, as well as excerpts from the lively audience discussion that followed.

At the AWM Business Meeting, the following two motions were passed:

That AWM form a committee to improve the public image of women in mathematics, which will work with the Executive Director and with Kathleen Holmay.

That the Committee on Relationships with Other Societies expand its activities to increase AWM's influence on the policies of the MAA, the NCTM, and other similar organizations.

(More on committees later.)

As usual, the AWM party was a smashing success, beautifully organized by Bettye Anne Case, who was unable to be in Salt Lake City to enjoy the fruits of her work. The turnout was good, and we had spacious quarters to mingle and enjoy.

Thanks to the efforts of Lori Kenschaft, the AWM table was filled with interesting AWM memorabilia. Her energy and enthusiasm were a welcome addition to AWM activities.

There were other meetings in Salt Lake City that focused on women's issues: the Joint Committee on Women in the Mathematical Sciences, and the first meetings of the MAA Committee on the Participation of Women, both of which will be summarized in future *Newsletters*. A report by Bhama Srinivasan and Susan Lennart on the percentage of papers published by women in AMS journals was presented at the Joint Committee meeting. A shocking 4.4% of papers are known to have women authors (17.3% are unknown).

Atlanta. There is an exciting program of AWM activities scheduled for the Atlanta meeting. On Wednesday, January 6 at 3:20 P.M., there will be a panel discussion called "Is the Climate for Women in Mathematics Changing?". Judy Roitman will be the moderator, with panelists Louise Hay, Mary Ellen Rudin, Nancy Stanton and Karen Uhlenbeck. The panel will be followed by the Business Meeting at 4:30. I am delighted to announce that the Emmy Noether Lecture, "Moment Maps in Stable Bundles: Where Analysis, Algebra and Topology Meet," will be delivered by Karen Uhlenbeck on Thursday, January 7 at 9:00 A.M.

AWM ELECTION

The Nominating Committee chose the following candidates: President-Elect – Jill Mesirov, Senior Scientist, Thinking Machines Corporation; Treasurer – Jenny A. Baglivo, Associate Professor, Boston College; and Members-at-Large – Ruth Rebekka Struik, Professor, University of Colorado at Boulder; and Carol Wood, Associate Professor, Wesleyan University. No additional candidates were nominated by the membership. Statements from the candidates follow. The ballot appears on page 21 and is due by December 1, 1987.

Jill Mesirov

Ten or fifteen years ago women were rarely invited to speak at national and international mathematical meetings. Through a concerted effort by the AWM and other committed individuals the situation has changed. Women are well represented on the list of invited speakers at sectional and national meetings of the AMS, MAA and SIAM. However, this is not the case at international and special meetings where women may be underrepresented or not appear at all. Only four women were invited to speak at the 1986 International Congress of Mathematicians out of a total of 140 invited speakers. There were no women invited to speak at the symposium held in honor of Hermann Weyl at Duke (May 1987), no women were on the initial list of speakers at the symposium to be held at Hofstra in honor of John von Neumann (May 1988), and only one woman was invited to speak at the AMS Centennial celebration (August 1988). The reasons for this are many, but the evidence is clear that we still have a lot of work to do.

We must continue to find ways to identify talented young girls and encourage their interest in mathematics. We must make sure that women are guided to the best graduate program for their needs and abilities. Women traditionally have been underrepresented in the top rank graduate programs; we should understand why that is true and help to correct it. Those who are professionally active in research, industry, or education have an obligation to our young women colleagues to support them at the beginning of their research or teaching careers, to bring them into the appropriate network, and to find creative ways in which to help them through the difficulties of two-career relationships and childrearing. Through our collective experience and efforts we can increase the number of active women in the mathematical sciences and bring their work to the attention of the rest of the community.

I hope in the near future we will also be able to broaden our membership base to include more of our colleagues in statistics, operations research, and computer science, so that we become an association for women in the mathematical sciences.

Rebekka Struik

I have been an activist in the women's movement since the early seventies when I was convener of the Boulder chapter of the National Organization for Women (NOW). I joined AWM as soon as I knew of its existence. For over a year I have been preparing the *Directory of Women in the Mathematical Sciences* for AWM, a time-consuming project. My educational background: BA: Swarthmore, 1949; MA: University of Illinois, 1951; PhD: New York University, 1955. My specialty is group theory. Since 1961 I have been at the University of Colorado; in 1980 I was promoted to full professor (a tale in itself). I believe women should help women; I see that as one of AWM's purposes: from encouraging junior high and high school girls to take plenty of math courses to Bhamu Srinivasan's project of getting women appointed to editorial boards of research journals. As an at-large member of the Executive Board, I would listen to proposals for AWM activities, pick one or two I considered good and feasible, and work on them.

Carol Wood

I have profited from the guidance and support of AWM since its founding. I am happy to have the opportunity to participate more actively in its work, and to serve in part as a liaison between AWM and other organizations.

LOCAL AWM ACTIVITIES : Please send in reports of activities of AWM at the state and local level. Share your ideas and inspirations, your ups and downs, with the rest of us. We'd like to have a column full of such reports!

REPORT OF THE TREASURER

JUNE, 1987

Accounting for the period June 1, 1986 to May 31, 1987

Balance as of June 1, 1986 \$43,532.56

Total Assets, June 1, 1986 \$43,644.44

Note: The figure \$43,644.44 represents \$43,532.56 cash-on-hand plus 5 shares of Washington Water Power, valued at \$111.88 as of 5/31/79.

RECEIPTS

Dues- Individuals	\$14,607.65
Families	1,000.00
Institutional	6,295.00
Pfizer Grant for AWM	1,000.00
Raytheon Grant for AWM	5,000.00
Cabot Corp. Grant for AWM	5,400.00
DEC Grant for Computer Science Summer Program	20,000.00
Raytheon Grant for CSSP	5,000.00
A.D. Little Grant for Kovalevsky High School Day	1,000.00
Mitre Grant for Kovalevsky HSD	750.00
Raytheon Grant for Kovalevsky HSD	500.00
DEC Grant for Kovalevsky HSD	1,000.00
Interest	3,248.78
Contributions	1,515.00
Advertising Fees	880.00
Miscellaneous	325.40

TOTAL RECEIPTS \$67,521.83

EXPENSES

Computer Science Summer Program	\$25,000.00
Wages & FICA (1)	11,240.00
Newsletter (2)	6,857.86
Raytheon Grants (3)	6,436.82
IBM Personal Computer	4,593.40
AWM National Meetings	2,113.64
Kovalevsky High School Day (4)	2,402.36
Dues & Fees (5)	231.00
Phone	711.12
Postage	830.25
Copying	818.11
Supplies	994.23
Speakers' Bureau (6)	541.10
Bulk Mail Deposits	843.53
Massachusetts Income Tax	136.89
Miscellaneous	52.89

TOTAL EXPENSES \$63,803.20

BALANCE as of May 31, 1987 \$47,251.19

- (1) Part-time Administrative Assistant.
- (2) Postage, phone, supplies, duplicating.
- (3) Grants to women high school teachers to learn Pascal and/or Data Structures.
- (4) We have not yet received the major bill for the Kovalevsky High School Day from Simmons College.
- (5) Conference Board of the Mathematical Sciences, Massachusetts Incorporation Fee, Bulk Mail Permit.
- (6) Travel and accommodations for Speakers; phone calls and postage.

Membership Statistics: Our membership currently totals 1758, 210 of which are institutional memberships.

We have used up the entire Sloan Grant for the Speakers' Bureau. Therefore, until we obtain another grant for the Speakers' Bureau, there will be no honorarium given. Speaker's travel and accommodations will continue to be covered according to the guidelines, as they have been in the past. We had only 9 speakers this past year.

Respectfully submitted,

Lynnell E. Stern, Treasurer of AWM
Bolt Beranek & Newman Communications Corporation

HONORS AND AWARDS

Congratulations to Susan Staples of the University of Michigan! She was recently awarded an AAUW Doctoral Fellowship of \$10,000. She would like to encourage others to apply for these fellowships: the AAUW is seeking especially to help women in underrepresented fields. See page 20 for more information.

Laura Garcia, Texas A&M University, sends the news that she has decided to use her Ford Foundation Fellowship to pursue graduate studies in mathematics, rather than computer science as earlier announced in this column. She says it was a difficult decision, but she thinks it was the correct one.

Congratulations to Thelma E. Bradford of A. & T. State University, Greensboro, North Carolina! She received the Most Outstanding Service Award from Atlanta University, Atlanta, Georgia in May 1987.

AWM PANEL ON GENDER AND SCIENCE

panel discussion, AMS/MAA summer meeting, Salt Lake City, August 6, 1987

Martha K. Smith (moderator; University of Texas at Austin)

One outgrowth of the feminist movement beginning in the sixties is what is sometimes known as the "new feminist scholarship." Its idea is to examine the effect that gender (i.e., the differing socialization of men and women) has in various disciplines. This has had an exciting and very constructive influence in literature and the social sciences. Recently some scholars have undertaken feminist analysis of mathematics and science. However, whereas most practitioners of feminist analysis in literature and the social sciences have also been scholars in the fields they investigate, many of the people applying feminist analysis to mathematics and science have little knowledge of their fields. Not surprisingly, some of their conclusions strike mathematicians and scientists as spurious. Unfortunately, many of these conclusions have had widespread circulation and are believed

by nonscientists. One of our panelists, Mary Beth Ruskai of the University of Lowell, became concerned after spending two years at the Bunting Institute (a center of feminist scholarship). Last year she sent a letter about this situation to the AWM newsletter and the corresponding newsletter for women in physics. This prompted much discussion within AWM — and quite a challenge to Beth not to let the ensuing correspondence and invitations to appear on panels interfere with her research in mathematical physics. (Her next appearance will be on a panel at Barnard College in November.) Our second panelist, Patricia Kenschaft, has been active in AWM for many years. She is currently chair of the MAA panel on the participation of women. She organized and is president of the New Jersey chapter of AWM. Her article (the result of thirteen years of research) on Charlotte Scott appeared in the March issue of the *College Mathematics Journal*.

Mary Beth Ruskai (University of Lowell)

The current discussions in feminist theory about gender differences in science contain some very disturbing ideas. Some of these theorists consider existing science and mathematics incompatible with their conception of a true nurturing, feminine nature. Such views are invariably based upon stereotypes and misconceptions. Common themes include such notions as science is not creative; science is not intuitive; mathematics consists of reducing things to numbers; abstraction consists of removing all context; creativity and intuition are feminine, while logic, abstraction and objectivity are masculine.

It is particularly noteworthy that such ideas occur in what purports to be scholarly research. Thus, their prevalence cannot be fully explained by factors such as poor mathematics education which contribute to stereotypes about science among the general public.

In some cases, there is a misunderstanding not only of the role of creativity and intuition in science but of the very nature of creativity and intuition. For example, Sherry Turkle¹ emphasizes the difference between “soft,” creative, interactive, feminine programming styles; and “hard,” non-creative, structured, planned masculine programming styles. If Turkle’s criteria for creativity were applied to music, one would be forced to conclude that jazz, because of its improvisational character, was highly creative, while the more structured classical music of Bach and Beethoven was not creative.

In Roberta Mura’s interesting review² she discusses the view, propounded by both Leone Burton and Dorothy Buerk, that the attributes used to distinguish between masculine and feminine by Carol Gilligan³ and other gender theorists could more accurately distinguish between the stereotyped “school” mathematics and the “true” research mathematics. As I read this article, I noticed that many of these attributes (abstraction, formalism, lack of application, removal of context vs. exploration, done in context, considers limitations of a particular solution) could also *superficially* describe the distinction between pure and applied mathematics. Therefore, the gender difference theorists might logically be expected to regard fluid hydrodynamics and mathematical physics as especially feminine subspecialties. However, I am unaware of any such claims.

An article worth noting, despite its lack of reference to gender, is a review by Martin Krieger⁴ of a book with the intriguing title *The Ethnomethodological Foundations of Mathematics*. Krieger’s review includes a nice discussion of the role of intuition and examples in mathematics.

Those who do admit that science can be creative and intuitive often present this as a rare exception, e.g. Barbara McClintock, or a new and radical idea. This occurs in the book⁵ *Women’s Ways of Knowing*, which was recently brought to my attention by a psychologist concerned with math anxiety, although it does not deal directly with mathematical learning. The book (which I did not have an opportunity to read thoroughly) describes several styles of learning including both the intuitive and “doubt-proof” scientific styles. The book concludes with a description of “integrated knowledge,” a blend of intuition and logic which a *few* pioneering women have achieved. The authors seem unaware that “integrated knowledge” represents a mode of thinking common, albeit imperfect, amongst both female and male scientists.

A particularly extreme point of view has been expressed by Sandra Harding.⁶ Harding claims that only 200-300 scientists are engaged in path-breaking, creative scientific research; the other 1,999,700 (Is this an abuse of quantitation!) of us can be characterized as assembly-line factory workers doing routine technical work.

I would like further to discuss Harding’s book, *The Science Question in Feminism*. The title is explained at the end of chapter 4, which is concerned with flawed biological and sociological theories about women. The assertion of women scientists that thorough analysis of such theories inevitably

reveal them to be based upon bad science does not satisfy Harding, who objects to the "bad science" vs. "science as usual" analysis. She concludes⁷ by stating, "Clearly, more scientifically rigorous and objective inquiry has produced the evidence supporting specific charges of androcentrism — but that same inquiry suggests that this kind of rigor and objectivity is androcentric! It is this paradox that raises the Science Question [Harding's capitalization] in feminism."

Harding reserves her worst diatribes for physics and physicists, "...the status of physics as the model of science should deteriorate... a critical and self-reflective social science should be the model for all science...", and "If physics ought not to have this status, then feminists need not 'prove' that Newton's laws of mechanics or Einstein's theory of relativity are value-laden in order to make the case that the science we have is suffused with the consequences of gender..."⁸

However, mathematics also seems to suffer from guilt by association with physics, as Harding concludes her indictment of mathematics with "It should be sufficient to point out that mathematics is so useful in physics, more limitedly useful in biology or economics, and only rarely useful in anthropology or history..."⁹ One wonders where she gets her information when she makes such claims as "Leading mathematical theorists point out that the ultimate test of the adequacy of a mathematical concept or proof has always been pragmatic: Does it 'work' to explain the regularities in the world for which it was intended to provide an explanation?"¹⁰ and "...the subject matter of physics is so much less complex than the subject matters of biology and the social sciences... Physics looks at either simple systems or simple models of complex systems."¹¹

Despite the danger of out-of-context quotations, I feel these passages give an accurate idea of the flavor of Harding's book. Moreover, I felt that including this digression was important in order to give an indication of how absurd some extremists can get.

The problems described above can be at least partly attributed to the lack of interaction between feminist theorists and women scientists. I should like to emphasize that it is important not to take an elitist position regarding who are the "real scientists". The point is that social scientists have a very different perspective from that of mathematicians and physical scientists. Indeed, both groups are different from biologists and biochemists. Similarly, someone who received a PhD in physics or mathematics 10-20 years ago and subsequently worked in administration or women's studies has a very different perspective than one who has been actively doing research for the past 10 years. We need to include *all* these viewpoints, as well as those of people who are primarily engaged in teaching. I have emphasized the importance of including women active in research in the physical and mathematical sciences because of their relative absence in the past. When math anxiety is an issue, it is especially important to include active high school and college mathematics teachers, as well as psychologists and education specialists.

As a prime example of this problem, I would like to describe an encounter with the author of a forthcoming book on women and technology. She was especially proud of an appendix which contained sample curricula, compiled as the result of suggestions solicited through a large mailing to women's studies centers. I asked which organizations of women scientists or engineers, such as AWM, had been contacted. Not one!! This is completely unacceptable. (Perhaps AWM should formulate and distribute curriculum recommendations for the mathematics component of a course on issues involving women and science.)

The lack of involvement of women scientists in women's studies is the subject of a paper¹² by Sue Rosser. Unfortunately, I found this article extremely condescending and offensive to women scientists. Rosser describes six stages of feminism; organizations such as AWM represent only a relatively unenlightened third stage. She characterizes women scientists with this quote from Vivian Gornick:¹³ "A woman scientist of only thirty years ago was a lady eccentric, a denatured bluestocking, a nineteenth century New Woman. She wore tweeds and oxfords, cared nothing for love, kept a cat, and smoked cigarettes. Adopting the style of the gentlemen scientists among whom they worked, these women acceded in a socially repressive atmosphere to an even deeper repression of self." Contrary to Rosser's implication, Gornick does not consider this a description of a canonical woman scientist; Gornick applies it exclusively to women over 65 (for whom it is obviously both inaccurate and offensive). Gornick continues "... a group portrait of contemporary women scientists is ripe with significant variousness. One sees women who are scientists occupying every position on a wide spectrum of personality types." Rosser's paper is further marred by several other, similarly outrageous, out-of-context quotes from Gornick.

Some feminist theorists appear to disregard the opinions of women scientists because they feel that we have been corrupted by our contact with the male scientific establishment.¹⁴ Although Harding does not address this issue directly, she is very mistrustful of all scientists whom she frequently refers

to as "the natives." She regards anyone who has come in contact with scientists, including philosophers and historians of science, as tainted.¹⁵ Thus, she regards the entire history of science as a "myth" comparable to "...the *Iliad*, the *Odyssey*, the Book of Genesis, or fourth-grade histories of the American Revolution."

Much of the literature I have been discussing appears to exhibit a strong sense of technophobia or anti-science bias. I have been struck by how many characteristics this bias has of other forms of prejudice, such as racism and sexism. Three aspects of familiar patterns of discrimination are quite apparent, namely: (1) reliance on stereotypes, (2) failure to recognize the accomplishments of women scientists, and (3) the imposition of unreasonable standards. I have already discussed the first; I would now like to mention some specific examples of the second.

Despite the extensive discussion of gender differences in Turkle's book, there is virtually no mention of the numerous contributions of women to computer science. She refers to COBOL as an IBM business language,¹⁶ without ever mentioning Grace Hopper (who conceived of, designed, and supervised the development of COBOL — on a Univac). Turkle has one reference to Ada Lovelace, whom she describes as "a friend and patroness of Charles Babbage" with no mention whatsoever of her achievements.¹⁷

It is particularly illuminating to contrast Turkle's treatment of Lovelace with that of Pamela McCorduck,¹⁸ a journalist who has written several books on computers and artificial intelligence. Turkle and McCorduck both quote the identical passage about AI from Lovelace, and criticize it on similar grounds. But McCorduck, unlike Turkle, includes a charming 2-page vignette about Lovelace, her mathematical talent, and her contributions to computer science. It appears that McCorduck, who is not concerned with gender differences, can afford to praise Lovelace despite some disagreement, while Turkle denigrates her.

Turkle's neglect of the contributions of women to computer science also compares unfavorably with their treatment by Herman Goldstine.¹⁹ Although Goldstine's *The Computer from Pascal to von Neumann* is hardly a feminist tract, it is replete with the names of women who contributed.

Another example of the failure of the feminist community to recognize the accomplishments of women scientists is the conspicuous absence of Nobel laureate Rita Levi-Montalcini from *Ms. Magazine's* 1986 women-of-the-year list, despite the precedent-setting inclusion of two other foreign women. *Ms.* has rarely honored women scientists, although they honored Sherry Turkle (who is a psychologist, not a computer scientist) for the book whose treatment of women in computer science leaves much to be desired. It would be interesting if someone could make a comprehensive study of these women-of-the-year lists. Did *Ms.* ever take note of any of Julia Robinson's accomplishments??

Finally, I cannot refrain from noting that Harding bluntly states that "...Marie Curie and now Barbara McClintock notwithstanding... there are few woman worthies to restore to science's halls of fame."²⁰

Returning to my analysis of patterns of discrimination, I should explain that point (3) does not merely refer to the imposition of unreasonably high standards on women scientists, which is covered by point (2) as in the examples above. Rather, I refer to the more general imposition of unreasonable standards, which leads to the conclusion that science is rotten to the core.

Despite the absurd numbers quoted earlier, Harding's thesis that there are only a few top scientists is essentially correct. What is problematic is her denial that the rest of us are also doing creative work, and the implication that the situation is different in other fields. There are, after all, only a few top composers, conductors, sopranos, etc. To perform creatively, musicians must learn and practice their technical skills. Hack writers and third-rate painters churn out works with minimal creativity. These universal gradations in quality and creativity are ignored by those who, like Turkle and Harding, seek to impose a black and white view upon science.

Harding's view of scientists as factory workers is somewhat curious in view of the fact that others²¹ have emphasized the "isolated genius" picture of the scientist, often epitomized by Barbara McClintock. These critics claim that working alone is unfeminine because women are more people-oriented than men. Thus, both group research and individual research have been alleged to be inimical to women. I regard this as an example of putting science in a no-win situation, a phenomenon which forms another facet of my unreasonable standards thesis.

Having described a rather bleak picture thus far, I would like to introduce a note of optimism. I have found considerable support for our point of view, particularly amongst women scholars in such fields as history and literature, and those in the traditional arts. Many women scholars are uncomfortable with the notion that science is rotten to the core, and with the more extreme aspects of gender difference theory in all fields. They would welcome more contact with women scientists, but

have surprisingly little contact with those at their own institutions and seem very unaware of such organizations as AWM. (I am aware of instances in which a member of the women's studies center at University X has stated that no one in their mathematics department is interested in women's issues, although there is an active, well-known member of AWM at University X.) I believe that we need to take a more active role in promoting interactions with women's studies groups.

Without some action on our part, they will rely on the writings of gender difference theorists, such as those I have quoted. The bookstores in Harvard Square have an astonishing number of books on women and science, generally written by sociologists and feminist theorists whom — with the possible exception of Evelyn Fox Keller²² — most of us have never heard of. For example, in addition to the book from which I have quoted, Sandra Harding (who is a philosopher) has edited two anthologies^{23,24} about gender and science. It would be most unusual for Ann Koblitz's biography²⁵ or other books about Sonya Kovalevskaya or Emmy Noether to be found on a women's studies reading list.

Some members of the audience mentioned the books by Bleier,²⁶ Fausto-Sterling,²⁷ Hubbard,²⁸ and others regarding the topic of flawed biological theories about women. This is an important topic, whose inclusion should certainly be encouraged rather than objected to. The problem occurs only when extremists extrapolate from these examples of "bad science" to the thesis that science is rotten to the core. Even when this does not occur, I would find it unfortunate if this were the major emphasis of a course on women and science. These topics constitute only a small part of the biological sciences, and have little relevance to the physical sciences. If this were to constitute the bulk of a non-scientist's exposure to science in college, that would certainly give a distorted impression. Thus, my enthusiasm for the subject matter of these books is tempered by a concern for a balanced curriculum.

Finally, I would like to comment on an issue raised by the recent *NY Times* article²⁹ about Benbow and Stanley's theory of sex-related differences in mathematical ability. As Martha emphasized in her introduction, there is a distinction between biological (sex) differences and cultural (gender) differences. Some theorists find an emphasis on cultural differences to be less objectionable than an assertion about biological differences. Personally, I do not find this distinction very important. Moreover, while I agree that we need to respond to the *NY Times* article, as well as address the serious flaws in Benbow and Stanley's work, I also think we need to re-examine our attitude.

Does it really matter whether differences are cultural, biological, or non-existent artifacts of testing? Women are now encouraged to climb mountains, run marathons, and engage in other athletic endeavors despite the documented differences between male and female muscular development. About 20% of PhD's in mathematics now go to women. We have ample evidence that a significant number of women are not only capable of doing mathematics and science, but also *enjoy* it. The discovery of a sex-linked mathematics gene or hormone will not change that, nor would it justify sex discrimination. Any differences which may exist must be overshadowed by the variety of individual differences and preferences. The problem with gender difference theory is that it seems to be trying to define a canonical feminine woman. Instead, we need to emphasize the diversity of interests and ability; and the importance of not only tolerating, but encouraging, that diversity.

References

1. S. Turkle, *Computers and the Second Self: Computers and the Human Spirit* (Simon & Schuster, 1984), pp. 104-136.
2. R. Mura, "Feminist Views on Mathematics" in *Femmes et Mathématique* (1986), ed. L. Lafortune, pp. 201-215. Translation reprinted in *AWM Newsletter*, July-August 1987.
3. C. Gilligan, *In a Different Voice* (Harvard Univ. Press, 1982).
4. M.H. Krieger, *Adv. Math.* 64(1987), pp. 326-332.
5. M.F. Belenky, B. McVicker, N.R. Goldberger, J.M. Tarule, *Women's Ways of Knowing* (Basic Books, 1986).
6. S. Harding, *The Science Question in Feminism* (Cornell Univ. Press, 1986), pp. 68-73.
7. *ibid.*, p. 110.
8. *ibid.*, pp. 44 and 47.
9. *ibid.*, p. 52.
10. *ibid.*, p. 48.
11. *ibid.*, p. 44.
12. S.V. Rosser, "The Relationship Between Women's Studies and Women in Science" in *Feminist Approaches to Science* (Pergamon, 1986), ed. R. Bleier, pp. 165-179.
13. V. Gornick, *Women in Science* (Simon & Schuster, 1983), p.120. [Many of Gornick's remarks, particularly in the introduction, are quite insightful; she emphasizes the creative nature of science, and denies that women do science differently. Unfortunately, most of the book consists of caricatures of women scientists in a style more suited to *People* magazine or *The National Enquirer*. The result is often offensive and lends itself to the kind of exploitation in which Rosser indulges.]

14. H. Rose, "Hand, Brain, and Heart: A Feminist Epistemology for the Natural Sciences" in *Signs* 9, no. 1. Reprinted in Ref. 24.
[See her comments on *Women in the Scientific Professions* (NY Academy of Science, 1965) which contains an autobiographical contribution from Marian Pour-El. See also Harding's (p. 143) discussion of Rose's work in which it is asserted that "A feminist epistemology cannot originate in meditations upon what women do in laboratories, since the women there are forced to deny that they are women in order to survive..."]
15. S. Harding, *op. cit.*, p. 207.
16. Turkle, *op. cit.*, p. 227. The relevant passage is "...business languages, for example the IBM languages FORTRAN and COBOL, and the 'scientific' language PASCAL...".
17. Turkle, *op. cit.*, p. 274.
18. P. McCorduck, *Machines Who Think* (Freeman, 1979), pp. 26-27. See also p. 205.
19. H. Goldstine, *The Computer from Pascal to von Neumann* (Princeton, 1972).
20. S. Harding, *op. cit.*, p. 31.
21. L. Standish, "Women, Work, and Scientific Enterprise," *Science for the People* 14(1982), p. 14.
22. E.F. Keller, *Reflections on Gender and Science* (Yale, 1985). See also *A Feeling for the Organism* (Freeman, 1983) and "The Anomaly of a Woman in Physics" in *Working It Out* (Pantheon, 1977), pp. 77-91.
23. S. Harding and M. Hintikka, eds., *Discovering Reality: Feminist Perspectives on Epistemology, Metaphysics, Methodology and Philosophy of Science* (Reidel, 1983).
24. S. Harding and J.F. O'Barr, eds., *Sex and Scientific Inquiry* (Univ. of Chicago Press, 1987).
[The field distribution of the contributors is: history (6), philosophy (3), sociology (3), biology (2), psychology (1), mathematics (1; E.F. Keller), and other non-science (2).]
25. A. Koblitz, *A Convergence of Lives* (Birkhäuser-Boston, 1983).
26. R. Bleier, *Science and Gender: A Critique of Biology and Its Theories on Women* (Pergamon, 1984). See also Ref. 12.
27. A. Fausto-Sterling, *Myths of Gender* (Basic, 1986).
28. R. Hubbard, M.S. Henifin, and B. Fried, eds., *Women Looking at Biology Looking at Women* (Schenken, 1979).
29. D. Coleman, "Girls and Math: Is Biology Really Destiny?", and A.L. Yarrow, "A Raft of Plans That Try to Dispel Math Anxieties", *New York Times* (August 2, 1987), Education section, pp. 42-45.

Pat Kenschaft

Problems abound. Today is the anniversary of one of the worst ever, and Hiroshima is not totally irrelevant to our topic. We are considering the ethical use of mathematics, and how groups of people interact.

During the first ten years of AWM I tried to interpret feminism to the math community, and at the decade celebration, I felt we had made progress. Then I decided to turn to interpreting mathematicians to feminists. The hostility I met startled me. Recently, I have become suspicious that feminists are not any more hostile toward mathematicians than most Americans. Too much they see us as unfeeling people who design bombs.

Historically, it is puzzling that feminists see the mathematical community as so threatening. The first Ph.D. earned by a woman in the nineteenth century was earned in mathematics. The first nineteenth century woman professor in a European university was the same woman, Sofia Kovalevskaia. The first British woman to earn a doctorate was Charlotte Scott, a mathematician who later was on the first Council of the American Mathematical Society. The first woman to earn a doctorate in the United States was a mathematician, Christine Ladd Franklin. The *non*-mathematicians on the Johns Hopkins Board of Trustees denied her the degree that the mathematics department certified she had earned, simply on the grounds that she was female. The first woman to be granted a doctorate in the United States also was a mathematician, Winifred Edgerton (later Merrill) in 1886.

The acceptance of women by the mathematical community a century ago, while they were spurned by most male-dominated communities, raises profound questions about the present situation. Why do feminists perceive us as malevolent? Why was it that last year women received only twenty percent of the doctorates in mathematics awarded to Americans, far less than the percentage of women earning all doctorates? Have mathematicians turned hostile toward women? I don't believe so. I see plenty of sexism among mathematicians, but it is not as plentiful or as egregious as that reported in many other communities.

No, I believe that we must look elsewhere for explanations of the scarcity of women mathematicians. Personally, I believe that the difference in the sexes' participation in mathematics is due to an abundance of environmental reasons, and has nothing to do with genes. Many people have pointed to many reasons that I consider valid. The AWM newsletters have been full of such causes. Today I will add two more that I rarely hear mentioned, one primarily within and one primarily outside the mathematical community. Both, I believe, shed light on the misunderstandings between feminists and mathematicians.

First, there is a widespread belief in the mathematical community that math research is a young person's activity. Since the youth of women is often seriously complicated by reproductive matters, a

tendency to discourage people who are not young falls disproportionately hard on women. However, this belief also harms men who are poor or for any other reason begin late to spend extended time with mathematics.

Nancy Stern, a sociologist who has since become a computer administrator, wrote a much neglected but highly significant paper addressing this belief. She surveyed the number of published papers of all members of the National Academy of Sciences and, separately, of every other mathematician listed in the catalog of every other university listed as the leading forty in mathematics. She classified the published papers that they had written at various ages beginning with "under 35" and proceeding through five-year intervals, such as 35-39, and ending with 60-64. She discovered that there was no significant difference between the youth and the pre-retirement years of productive mathematicians in numbers of papers published. Then she repeated her computations for the number of citations of the papers, with the same result. In both cases there was a dip for people in their late forties. She attributed this to the tendency of people at that age to take leadership roles, becoming chairs of departments and officers in organizations. The paper, titled "Age and Achievement in Mathematics," appears on pages 127-140 of the February, 1978, issue of *Social Studies of Science*. I believe it deserves far more attention from AWM than it has thus far received.

The belief that only young people can do mathematical research affects primarily the upper levels of mathematical achievement, but I believe that the trickle-down theory effects are strong here. Let's look at the data compared to other fields. The accompanying three tables show the percentage of degrees granted to women at the bachelor's, master's, and doctoral level, respectively. The middle thick line is a compilation of all degrees, the top thick line is education, and the bottom thick line is mathematics. According to page 20 of the book *Women in Mathematics* (edited by Chipman, Brush, and Wilson, published in 1985 by Lawrence Erlbaum Associates, Inc. in Hillsdale, NJ 07642), women's share of bachelor's degrees in mathematics has been about 92% of their share of all bachelor's degrees, their share of master's degrees in mathematics has been about 73% of their share of all master's degrees, and their share of doctorates in mathematics is about 53% of their share of all doctorates. This paragraph in the book's introductory article, "Outlining the Problems," concludes, "Therefore, there does seem to be some specific problem relating to women's transition to graduate study in mathematics."

Let me suggest a personal example of how this might happen. My thesis advisor is a kind and thoughtful person. He offered to wait for several years while my children were tiny until the time that I could put more time into my dissertation. I read the books he suggested, studied math every spare minute, and used my time free from my children to go to a nearby math library to browse. I felt that my mathematical maturity increased significantly during that time. When I returned to him at the age of thirty-two, ready to begin work on a specific thesis he said he thought I was too old and had been away too long. I got angry and gave him a piece of my mind. He used his better judgment, put aside his indoctrination from the math community, and a year later I had my doctorate.

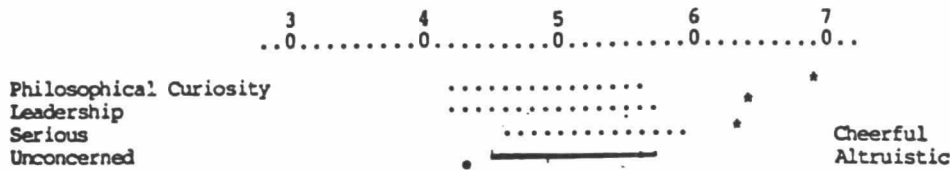
Many other dissertation advisors have not been so liberated from this old math tale — that people past thirty can't do math. Does it matter? If my advisor had not been so broadminded, there would have been no woman at Montclair State with a doctorate in mathematics during the past fourteen years, serving as a role model for the many young women math majors there. There would not be a New Jersey chapter of the Association for Women in Mathematics having regular meetings during the past six years and frequent publicity in the New Jersey papers. Probably the achievements of Charlotte Scott would not be recognized to the extent that they have been, and hundreds of high school students and dozens of high school teachers would not have heard me speak. Perhaps I am overly egotistical, but I believe that if my thesis advisor had been as rigid in his belief about the importance of youth to mathematical research as are many senior mathematicians, there would be significantly less participation by women now in the mathematical communities of New Jersey, and not just at the top levels. The myth that youth is essential for mathematical research is not specifically an anti-woman myth, but it is one significant explanation for the underrepresentation of women in mathematics at all levels.

My second idea is harder to verbalize. It reflects a constellation of social pressures that, I believe, divert females of all ages from attending to mathematics as they otherwise might. It also helps explain why mathematicians, as a group, are not warmly received by the larger society. Last year I received a request from a "professional assessment service" to take a battery of tests they give to young people to help them plan their careers. They needed people established in their careers against which to measure the validity of their tests.

PERCENT OF DEGREES GRANTED TO WOMEN 1950-1982
copied from *Professional Women and Minorities, Scientific Manpower Commission*
Source: *Series of Earned Degrees, USOE and Summary Report, Doctorate Recipients from United States Universities, 1971-1982*



On the whole the results seemed valid. Four of my results, excerpted from three tables, are below. For each of these measures five is the median score and the (dotted or solid) line indicates the range of a "normal" female. The three stars and single dot indicate my ratings on these four characteristics. My placement above a normal female in "philosophical curiosity," "leadership," and "cheerfulness," seems appropriate, as did most of my other (more average) scores.

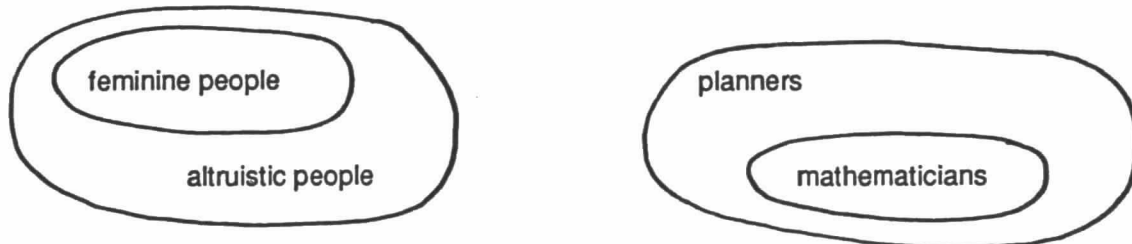


The one striking exception to the apparent validity of this battery of tests may be a clue to the topic we address today. I think it reflects something about the entire mathematical community and women's trouble with it. On the measure for "altruistic" I fall *below* the range for a normal woman. My selection for this panel might raise doubts about this, even if you don't know that I have taken in foster teenagers, or that I continually write to legislators on many topics, or that I often give flowers to secretaries and custodians. Most people who know me, even if they don't like me, would not rate me deficient in altruism.

"What is going on?" I asked a number of my acquaintances. The explanation of an old friend of my mother's, who has known me since I was a tot, clicked. "You are always planning," she said. "You are always wondering if you might be doing something even better. You don't just look at a situation where someone is in trouble and immediately run in. You wonder if there is something more important for you to be doing." I am looking for patterns, as mathematicians are trained to do. I think ahead. I don't always run to help, because there may be a better use of my time and there may be a more effective way to improve this situation in the long term.

For similar reasons I don't always answer a student's math question immediately. It may be better for her to struggle until she sees the answer for herself. I don't spend as much time as some students would like on some questions or topics because if I do, the class won't complete the curriculum and then none of its members will flourish in the succeeding course. I don't just feed my students the material needed to do well on a test. I plague them with the underlying concepts, a tendency which is sometimes perceived as downright sinister. I don't give a good grade if the student hasn't earned it. All of these practices may indicate to test-makers that I am not altruistic. Planners are seen as automatically not altruistic.

This may also explain why my tendency to plan may be perceived by Sherry Turkle to mean that I am not feminine. All feminine people are altruistic. No altruistic people are planners. Thus feminine people do not plan. Women who do plan are denying their femininity.



This is a cruel conclusion because almost *any* highly achieving woman *must* plan carefully to juggle the many obligations that society places upon her. In any human emergency involving family or friends, there are strong social pressures for females to drop all other goals and help. This *may* be

especially hard on women with technical goals because learning math involves sustained hard work. However, the social prejudice that planning and pattern-finding are malevolent, and that such behavior prevents people from being altruistic and enjoying the here-and-now, deters more people than just women from approaching math positively.

There are many social pressures against girls and women enjoying mathematics as much as their brothers do. However, the myth of math as a young person's sport and the belief that planning and altruism are incompatible have not received their share of the credit — or blame. Both are worth fighting for, for reasons other than the underrepresentation of women in science. If humankind is to avoid suicide, we must have caring people involved in planning, and mathematicians must be involved in ethical decisions. I leave you with a question. How can the mathematical community tell the world we do care? How can we be seen as more altruistic? A satisfactory answer might go a long way to change the sex imbalance in our field.

Discussion

Lida Barrett: Is there a good book on gender and science that we can recommend to women's studies departments?

Beth Ruskai: As far as I am aware, there is not a complete book. There are a few articles. A couple years ago there was some talk of AWM preparing something, but I am not aware of anything at this time.

Pat Kenschaft: I recommend *Women in Mathematics: Balancing the Equation*. [Ed. note: edited by Susan Chipman, Lorelei Brush, and Donna Wilson, Hillsdale, NJ: Lawrence Erlbaum Associates, 1985. Also see *Women of Mathematics*, edited by Paul Campbell and Louise Grinstein, Westport, CT: Greenwood Press, described on page 19 below.] This book certainly seems to reflect my viewpoint. And there are numerous biographies of individual women mathematicians, which can be very helpful.

Jean Taylor: I'd like to respond to [Ruskai's] letter in the *Newsletter*. I attended a course at Rutgers on feminist theory. The course lasted three weeks, and one two-hour session was devoted to gender and science. I found it all very interesting. I had two reactions to what you were saying in your letter.

One thing that you said that we have to agree with is that it is very clear that all the science which has been done is influenced by masculine prejudices. An example of this, in a slightly different vein, is Stephen Gould's *The Mismeasurement of Man*, which shows the effects of racial prejudices on what has been done and is a wonderful book. Anyway, Ruth Bleier, a neurobiologist at the University of Wisconsin, spoke to us, and she pointed out that so much attention is given to small differences on the average between men and women, but that there is a very much larger range of differences among individuals. So there is this enormous scale but so much attention to very small differences.

The second thing is this characterization of science as masculine or feminine. I don't like anything to be characterized as feminine: not your interests, not the way you walk, not the way you do mathematics. When people ask me, "How, then would you characterize a way of doing science that is... global and... nondogmatic" I say, "Well, I'd just call it 'global' and 'nondogmatic.'"

So I found it a very interesting course, but I wish we could have had you there because I think it would have been interesting to hear what you had to say.

B. Ruskai: I have two comments. First, there will be a conference at Barnard on November 14th at which I will be speaking, along with physicists and social scientists. The other thing is that I don't have any problems with Ruth Bleier, or Ruth Hubbard, who talk about the effects of prejudice on research. The problem is that people extrapolate from what they are saying to claim that science is bad to the core.

J. Taylor: But there is a lot of variety in science: it's not science *per se*.

B. Ruskai: Also, let me point out that Ruth Bleier shows that these studies are, in fact, bad science. But some people say that it is not a matter of "bad science" or "good science." They deny the evidence; they want something else entirely.

Alma Marosz: I just want to mention the existence of a women's studies program that is very supportive. It is located at San Diego State University.

James Glimm: I am delighted to hear that fluid dynamics and mathematical physics are such feminine subject matter. I currently have two female graduate students.

A lot of attention has been given recently to scientific education in general. People are very concerned about the problem of the generally poor quality of education in science, and there is a lot of discussion about how to improve it. Your voice should certainly be contributing to this discussion.

Martha Smith: I would like to put in my two cents. Referring back to what Pat Kenschaft was saying, I want to emphasize that the myth that mathematics is a young person's activity differentially affects women and minorities. This is also true about other myths about mathematics. So the most important thing for increasing women's participation in mathematics is to improve the position of mathematics in general. Studies have shown that the high schools with the highest percentage of female mathematics students are those that have the strongest programs in science. So working on general scientific education should be of high priority in our efforts to encourage young women to go into mathematics.

Robert Decker: I object to [Ruskai's] implication that none of the people who are currently writing about gender and science are scientists. Evelyn Fox Keller, to whom you briefly alluded, is a scientist.

B. Ruskai: As I said, I don't want to quibble about who is and who is not a scientist. But I do want to point out that Keller has not published any research for ten or fifteen years. She is not a practicing scientist. But, whether or not she is a "scientist," the real point is that she should not be the only voice representing women in science.

Barbara Rice: Before I am a woman or a mathematician, I am a person.

I went to graduate school in the 1950's. It was very difficult, but I succeeded and got my PhD and found employment. It took me years to join AWM because I was afraid of what it might do. I was afraid that the feminist movement would interfere with and muck up things that individuals are trying to achieve. For example, many universities are now interested in increasing the number of women on their faculties, but usually that means hiring women in women's studies, or education, or nursing. And so women get distracted from fields like mathematics.

I want to make it clear that I am not against this organization. But it is very important not to allow oneself to become embroiled in subtleties and make-work. Individuals can move forward by themselves, with a lot of hard work. But it does help to have a national organization.

The really important factor, however, in getting women into mathematics is that women have more time now. They don't have to spend as much time taking care of the family. In the 1950's, women used to have to make very difficult choices between their children and their jobs. These choices kept a lot of women out of mathematics. In the 1950's, people used to ask me, "You're married. Why are you still in school?" I didn't really know what I was going to do with the education, but I did know that I was going to do more than just take care of a family. And I have. I've been employed, and at the same time I have four children. I have done both.

Rhonda Hughes: Things aren't much better now than in the 1950's. The choices are still very difficult. It's very important to have an organization like AWM to help you. I was in graduate school when I first heard of AWM, and it got me through. It was very important to me to be able to talk with other women. We would talk at meetings, or on the telephone, and these conversations would keep me going. This support function of AWM — the conversations, the *Newsletter* — is vital.

The problem that prevents more women in science from writing about gender and science is the elitism of institutions. This kind of research, research on gender and science, isn't considered to be real research. It therefore doesn't earn you any credit in tenure and promotion decisions. So most women can't afford to spend a lot of time thinking about gender and science: they have to do the research that will earn them recognition in their institutions.

Harriet Lord: But many women are not employed at research institutions, and many institutions are happy if you publish any kind of research. This is a problem with AWM in general: it tends not to

recognize that there are many women mathematicians who are not research mathematicians, even though the majority of women mathematicians — and the majority of all mathematicians — do not work at research institutions.

P. Kenschaft: And things really are a lot better than they were in the 1950's. In 1954, a woman whom I know was working as an actuary at Metropolitan Life and got married. A few weeks after her marriage, she received a letter from the company stating that it was company policy that a married woman could not be an actuary and that she was therefore fired. She is now a high school teacher. Such blatant discrimination could not happen now. The choices can certainly still be difficult, but the external conditions have certainly improved a lot since the 1950's. We owe a lot to the feminist movement.

M. Smith: Our time is just about finished.

B. Ruskai: In conclusion, I want to emphasize that we need input from lots of different kinds of people. We need to listen both to mathematicians and to social scientists, and we need to bring more voices into the discussion. We must listen to our differences, the differences in our positions in the world and the differences in our opinions, and we must respect those differences in an open and productive dialog.

REMEMBERING ALICE DICKINSON

by Joan P. Hutchinson, Associate Professor of Mathematics, Smith College, July 27, 1987

I had intended to write the AWM community of Alice B. Dickinson's death on June 25, 1987, due to Alzheimer's disease, when I read Rhonda Hughes' request for articles about departments and people who have been especially supportive of women and minorities. This spurred me on to write some thoughts about Alice's life and the inspiration many of us drew from her. As Professor of Mathematics and later Dean at Smith College, an undergraduate school for women, she was a role model and mentor to many women in mathematics and science long before such terms were current.

Alice Dickinson was born in New York City in 1921. She did her undergraduate work at Wheaton College and the University of Michigan. During World War II she worked for the M.I.T. Radiation Laboratory and the Sperry Gyroscope Research Laboratories on the design and testing of radar antennas. (She tested her work by flying with pilots who landed at night at unlit airports, guided only by the newly developed radar systems.) After the war she studied and earned her Ph.D. from the University of Michigan, working in topology with R. L. Wilder. Due to anti-nepotism laws, her first job at Pennsylvania State University was a temporary one; her husband David Dickinson is also a mathematician. In 1959 they moved to Massachusetts so that they could have jobs at neighboring institutions, Smith College and the University of Massachusetts. When Alice joined the Smith mathematics department she was the only woman in a department of five. When she retired in 1977, there were 5 1/2 women in a department of eleven. (My husband and I share a position. While Dean of the College, Alice instituted tenure-track shared and part-time positions.) Alice herself had wanted to teach part-time at first since they had two young children; however, a regular part-time position was not an option at that time.

I was an undergraduate at Smith College from 1963 to 1967 and joined the faculty in 1976. I hope that with a few personal recollections I can convey some of Alice's gifts as a teacher, as a colleague, and as a friend. As a freshman I was eager to try essentially all the liberal arts before choosing a major. In my second semester I had Mrs. Dickinson for calculus — literally within days I knew my choice of a major was made. Mathematics with Mrs. Dickinson became a challenging and irresistible exploration of a new and intricate world. For example, in that class I learned about the Lascaux cave-dweller paintings and the "floating" Babylonian calendar, and how carbon-14 dating and the related mathematics helped to date these. A subsequent differential equations course given by Mrs. Dickinson was alive with examples of clepsydras (water clocks), tunnels through the earth, vibrating strings and membranes, and bridges in resonance. The notes from this course became her book *Differential Equations: Theory and Use in Time and Motion*. Not only were her class presentations stimulating, but so also were the daily class discussions, based on homework assignments and outside

reading. In fact, students were asked to do a lot of independent work on in-depth assignments, on take-home problem sets (rather than tests), and on independent final projects that involved reading, working with newly-learned mathematics, and writing up the work in an expository paper. This type of study led me to a senior independent honors project under Mrs. Dickinson's direction in which I read Bourbaki in French, attended graduate seminars at the University of Massachusetts, and studied the theory of rings of continuous functions, a beautiful meeting ground of algebra, analysis and topology.

Mrs. Dickinson's appreciation of mathematics was felt beyond the classroom: she introduced English change ringing to the Smith campus with the installation of a peal of English tower bells and by teaching tower and handbell ringing. (In English change ringing, permutation groups, subgroups and cosets are rung in historically prescribed ways.) Mrs. Dickinson and other faculty members (including especially Mr. Neal H. McCoy, now Professor Emeritus of Mathematics) provided a fascinating learning environment for the women students of Smith College; many have continued in mathematics and related fields. I remember two particular comments of hers that really affected me. First, she suggested that a true test of what one was most interested in was the kind of books one read during summer vacation. Second, she asserted that if I was really serious about mathematics, I should study for a Ph.D. Both comments were surprises to me, but she was right.

Alice and her husband spent two sabbaticals in India. (One trip began by "hitchhiking" to Europe on a freighter.) Alice taught at the Muslim Women's College in Aligarh, the M.S. University of Aligarh, and the University of Baroda. At one institution her graduate seminar on topology was initially filled and overflowing: many came just to see a woman lecturer, it seemed! In India she learned to play the tabla drums and to cook wonderful curries. In this country Alice participated in a summer exchange program with a consortium of southern black women's colleges; she subsequently initiated a successful student exchange program between the consortium and Smith College. While Dean at Smith, Alice developed innovative new programs in engineering and dance, and she began the Ada Comstock program in which older women could return to Smith and complete their college degrees in individualized programs.

These are a few of the many facts of Alice Dickinson's life. I hope they convey also some of her spirit. She was a warm and unconventional person: she set and followed her own priorities, both professionally and personally. She filled her life with books and music, rather than more usual material possessions. She cared about individuals and affecting their lives positively.

Currently at Smith College 5% of all students major in mathematics with an additional 2-3% majoring in computer science; mathematics is currently the sixth most popular major. We have tried to understand the reasons for the large enrollments. Besides the standard mathematics curriculum we offer a range of applied mathematics courses and courses taught in a "Moore method" style; both these types of courses were first introduced to the department by Alice Dickinson. But, probably most important, members of the department try to continue the tradition of respect and encouragement for women students that we have learned from Alice Dickinson.

A STATISTICIAN GOES TO VIETNAM

by Arlene Ash, Boston University Medical School

Vietnam has a world-class capacity in theoretical mathematics, but "you can't eat prestige." Can mathematicians do something useful in an economically backward country still suffering from the residual effects of protracted war? The Kovalevskaja Fund evidently thought so when they offered a travel grant to enable an American woman researcher to give lectures in applied mathematics at the Vien Toan Hoc Institute of Mathematics in Hanoi in January, 1987.

I saw the ad inviting competition for that grant in the *AWM Newsletter*, and last April learned that I had been selected. With great effort I was able to arrange my work schedule (free-lance consulting and health policy research) to allow for eight weeks off. I wanted time to visit friends in the southern Philippines where I had taught mathematics as a Peace Corps volunteer (1967 to 1969) and time to tour. My "side trips" to Burma, Kampuchea, Thailand, the Philippines, and even to the south of Vietnam were useful as well as fun, providing a context for interpreting the vast differences between Boston and Hanoi.

My first surprise came at the airport in Bangkok, while checking in for the two-hour flight to Hanoi. There is so little intercourse between Vietnam and the United States that I had naively been

expecting to be the only Westerner on the plane. Not so, many western countries have a substantial presence in Vietnam, and I was soon to meet ambassadors from Great Britain, Australia and Belgium. In addition, Sweden has hundreds of people in its Vietnamese delegation and tour groups from Italy are common; the first two Westerners that I encountered in line for the plane were an Italian couple, vacationing on their own.

I had been led to expect bone-chilling damp in Hanoi in the winter, but the weather was untypically warm and quite glorious. Despite its southerly latitude (21° N, about the same as Guadalajara, Mexico) Hanoi, situated in a high flood plain, has a hybrid temperate/tropical climate. Occasional palm trees interrupt scenery that could otherwise be in New England; food markets overflow with tomatoes, lettuce, cabbage and other familiar vegetables.

My Vietnamese hosts were wonderful. I was given a large suite in the Thong Nhat Hotel which still shows traces of its heritage as the Metropole, once Asia's most elegant hotel. Basic services in Hanoi were better than reports from previous visitors had led me to expect. I experienced only one brief electrical outage during my stay and a few water interruptions — but the large, quaint, footed bathtub filled with hot water when I needed it, and every room has a table set for tea.

A car and driver were engaged for taking me to and from the Math Institute for my lectures, and was available for sightseeing too. I also had plenty of free time to stroll around beautiful Turtle Lake, and to wander into the bustle of traffic (mostly bicycles, other foot-driven, ingenious vehicles and barefoot peddlers, carrying baskets on the ends of shoulder poles). Occasionally one could see an official car like mine, and rare scatterings of ancient public transit, new-looking buses from Eastern Europe, and tractor and animal-pulled carts. Rush hour traffic, though chaotic, is so much less hair-raising when most of the vehicles are not gasoline driven. I was never able to convince my hosts that I was serious about wanting to get myself around on the bicycle which was available at the Institute. (Hanoi traffic is definitely daunting, despite my earlier remark.) Had I been in Hanoi longer, I would have tried harder to get the bicycle, but a variety of factors reduced my visit to only 22 days.

During my stay I gave nine lectures on topics including optimal experimental design, exploratory data analysis, new principles and ideas in the graphical display of quantitative information, regression diagnostics, design and analysis issues in clinical trials, applications of regression to public health policy and the investigation of charges of discrimination. Attendance varied at my lectures from about 12 to 30 people, including visitors from institutes of statistical science, pedagogy, agriculture and meteorology. Some folks were there mainly to practice their English — others were getting ideas for future research.

While in Hanoi I took part in a Seminar on Women in Science in the Developing Countries. Over fifty representatives from countries throughout Asia and as far away as the US, Sweden and Cuba attended this wonderful event. I enjoyed my first opportunity to present a talk for which simultaneous translation was provided. Many of the speeches were deeply moving. I was especially affected by the presentation of Vo Hong Anh, who happens to be General Giap's daughter, as well as a distinguished mathematical physicist. As she alluded briefly to the difficulties of completing her Ph.D. dissertation amidst the American bombing of Hanoi in 1971 I recalled how, as a graduate student, I had protested that bombing at a meeting of the American Association for the Advancement of Science in Washington, D.C. But at the time, I had no real sense of what it meant — no picture of a woman like myself, half a world away, struggling to complete her graduate work among the explosions.

The women's conference got a special interview with Pham Van Dong, Vietnam's prime minister. I was able to bring up the fact that my TV interview of the previous day had not been aired after I answered the question about "how I managed being a wife and mother and a scientist" by saying, "It's not a problem, since I'm neither a wife nor a mother." The Vietnamese are very family-oriented, and it is hard for them to see an unmarried or childless state as a positive thing, even only for some people. I argued that Vietnam, especially with its dense population, could afford to let young women have unmarried women scientists as role models. Ann Koblitz reinforced this point by saying that she and her husband Neal had not had, and did not intend to have, any biological children. In a very moving speech, she went on to describe the Kovalevskaia Fund (the foundation which had sponsored both my trip and the women's conference, as well as many other valuable scholarly exchanges with Vietnam and Nicaragua) as "their child." We didn't change the prime minister's view, but he did listen attentively to another way of looking at women's roles.

This exchange wasn't an isolated example. After a few, stiff introductory moments, the interview was astonishingly frank — almost a free-for-all — despite the intimidating decor of the French-built Presidential Palace. At one point, when Ann Koblitz and I were scrambling around on the

plush carpet seeking the best camera angles, she whispered in my ear "Isn't this a kick?", and it surely was.

As an outgrowth of the women's conference, six of us travelled to Kampuchea (formerly Cambodia) where we were treated like visiting heads of state. Pnom Penh looks wealthy and full of lively bustle compared to Hanoi. Much of this is historical and resource-driven (Kampuchea sits on a lavishly fertile delta), but it is still surprising because the city was totally non-functional in 1979 upon the overthrow of the murderous Pol Pot regime. Cambodians whom I met praised the film "The Killing Fields" as an accurate portrayal of life under Pol Pot. They cannot understand why the United States government continues to support this terrible figure. Nor can I.

My trip to Vietnam was a wonderful break. I came back refreshed, full of a heightened appreciation for the wealth and privilege of my daily life and utterly taken with the dignity, respect for learning, and liveliness of Vietnamese society. In addition to a wonderful and exotic vacation, I got a mini-sabbatical in which there was time and the excuse to do useful reading. Something useful for Vietnam may also have resulted. In a place like Vietnam, where politicians and academicians come from the same families, scholarly exchanges have a special potential for improved relations, beyond the obvious benefits of scientific cross-fertilization.

I would like to leave you with one striking observation: my trip cost *peanuts*; the Kovalevskiaia Fund gave me \$2,000 for travel and arranged with the Math Institute in Hanoi for my in-country expenses which would have been small, anyway. I would like heartily to encourage others of you to think of seeking to undertake (or helping to sponsor) such energizing and productive exchanges abroad.

WOMEN OF MATHEMATICS: A BIOBIBLIOGRAPHIC SOURCEBOOK

Women of Mathematics: A Biobibliographic Sourcebook, edited by Louise S. Grinstein and Paul J. Campbell, contains biographies and bibliographies of more than forty leading women mathematicians. The majority of the essays were written by women who are themselves mathematicians. Collectively, this reference work explores the barriers that have been faced, over the years, by the few successful women in higher mathematics.

Criteria for inclusion were recognition through attainment of advanced degrees despite extensive familial and societal pressures; innovative research results in some aspect of the mathematical sciences; influence exerted in teaching and guidance of students at both the undergraduate and graduate levels; active participation and leadership in professional societies; extensive scholarly publications; and participation on journal editorial boards. The essays have three sections — biography, work, and bibliography. The biography section includes known information about the subject's family background, education, and career. Particular attention is given to any circumstances and influences that affected her career. In the work section, an estimate is made of the individual's career and its significance. The bibliography section is divided into listings of "works by" and "works about" the subject. Omitted from the individual listings, but collected in an appendix at the end of the volume, are citations to standard reference works and other compilations. Two other appendices are included: one presents the subjects in chronological order by date of birth and graphically depicts the time span of their lives; the other summarizes in tabular form the data on place of birth, highest education attained, place of work, and specific field of mathematical interest.

This volume is an especially important contribution to our knowledge of women mathematicians. Apart from its value as a reference work, it will be useful for those contemplating a career in mathematics. Anyone interested in the history of mathematics or in the history of women will find it enjoyable and informative reading.

CONTENTS: Foreword by Alice Schafer. Preface by the editors. Introduction by Jeanne LaDuke. Women of Mathematics. Appendices: Biographees in Chronological Order by Birthdate; Biographees by Place of Origin, Highest Education, Place of Work, and Field of Mathematical Work; References in Biographical Dictionaries and Other Collections. About the Contributors. Name Index. Subject Index.

WOMEN OF MATHEMATICS: A BIOBIBLIOGRAPHIC SOURCEBOOK is published by Greenwood Press, Inc., 88 Post Road West, Box 5007, Westport, CT 06881.

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WOMEN AND THE NATURAL SCIENCES: PROBLEMS AND SOLUTIONS

The Barnard Center for Research on Women presents the conference "Women and the Natural Sciences: Problems and Solutions" on November 14, 1987. Professor Evelyn Fox Keller, author of *Barbara McClintock: Listening to the Organism and Gender and Science*, will deliver an opening address. The speakers in "Feminist Theory and Science: A Panel Discussion" will be Karen Barad, Professor of Physics, Barnard College; Anne Fausto-Sterling, Professor of Developmental Biology, Brown University; Elisabeth Friedman, Barnard '88; Temma Kaplan, Director of the Barnard Center for Research on Women; Sue V. Rosser, Director of Women's Studies and Professor of Preventive Medicine, The University of South Carolina; and Mary Beth Ruskai, Professor of Mathematical Physics, University of Lowell. Judy Young, Professor of Astrophysics, University of Massachusetts, Amherst and Betty Vetter, Executive Director of the Commission on Professionals in Science and Technologies, The National Science Foundation will speak on "What's Happening with Women and Science?" The speakers in "Developmental Stages of Women in The Sciences: A Panel Discussion" will be Maria Davis, Coordinator of the Center for Educational Leadership and the Scientific Literacy Improvement Project; Rosanne di Stefano, Professor of Physics, New York Institute of Technology; Michael Johnson, Engineer, Executive Director, After School Science Skills Center; Janna Levin, Barnard '88; Carmen Ortiz, Society for Hispanic Engineers; and Ellen Stern, Principal, Fieldston School, Riverdale. The conference is sponsored by Barnard College, Columbia University, and the Barnard Center for Research on Women.

TASK FORCE ON WOMEN, MINORITIES AND THE HANDICAPPED IN SCIENCE AND TECHNOLOGY

The Task Force on Women, Minorities, and the Handicapped will hold public hearings throughout the United States in the next several months. Hearings have already been held in Albuquerque, NM and Chicago, IL. A hearing is scheduled for December 1, 1987, Kansas City, MO. Dates of the following are to be confirmed: January, 1988, Los Angeles, CA; March, 1988, Atlanta, GA; April, 1988, Boston, MA; and May, 1988, TBA. A notice containing the exact street address will appear in the Federal Register approximately 30 days in advance of each hearing. The information will also be available at the task force offices at (202) 245-7477.

The task force has been charged by Congress to: examine the current status of women, minorities and disabled persons in science and engineering positions in the federal government and in federally assisted research programs; coordinate existing Federal programs designed to promote the employment of women, minorities, and physically disabled scientists and engineers; suggest cooperative interagency programs for promoting such employment; identify exemplary programs in the state, local, or private sectors; and develop a long-range plan to advance opportunities for women, minorities, and disabled persons in science and technology.

The membership of the task force is comprised of the major R&D sponsoring agencies and select individuals from the private sector. Dr. Ann Reynolds, Chancellor of the California State University System and Mr. Jamie Oaxaca, President of Wilcox Electric, Inc. are co-chairs of the task force. Sue Kemnitzer is the Executive Director.

Persons wishing to testify should write to the task force offices at: 330 C Street, SW, Room 2017, Washington, DC 20201.

AAUW FELLOWSHIP INFORMATION

The AAUW Educational Foundation, the philanthropic arm of the American Association of University Women, announces its funding programs for 1988-89. In 1888, the first fellowship was awarded to a woman by the AAUW for graduate study. The 1988-89 award year continues that 100-year-old tradition of offering financial assistance to women for higher education, research, and self-

development. The following fellowships and grant categories offer these opportunities for qualified candidates:

- American Fellowships: a) Dissertation Fellowships, to enable women to complete their doctoral dissertations (Awards are for \$10,000 for a twelve-month period beginning July 1. Fellows are expected to devote full time to their projects during their fellowship year.); and b) Postdoctoral Fellowships for independent research (Postdoctoral Fellowships are not awarded for the revision of dissertations nor for tuition for additional course work. There are no restrictions as to place of study. Preference is given to women who have held the doctorate at least three years. The awards are for a twelve-month period beginning July 1. Fellows are expected to devote full time to their projects during the fellowship year.). Deadline: November 15, 1987.
- Selected Professions Fellowships: Funding for the final year of graduate study in the fields of Architecture (M. Arch.); Business Administration (M.B.A.); Engineering (M.E., M.S.); Law (J.D.); and Medicine (M.D., D.O.). Deadlines: December 15, 1987, except M.B.A.; February 1, 1988, M.B.A. only.
- International Fellowships: Funding for graduate study or research for women who are not citizens or permanent residents of the U.S. and who will return to their home countries. Deadline: December 1, 1987.
- Research & Projects Grants: Assistance for women conducting non-degree research in the public interest or returning to school for career development after a five-year lapse since their last degree was received. Deadline: February 1, 1988.

For application forms, write AAUW Educational Foundation, 2401 Virginia Avenue, N.W., Washington, DC 20037.

DEADLINES: Nov. 24 for Jan.-Feb., Jan. 24 for Mar.-Apr., Mar. 24 for May-June
AD DEADLINES: Dec. 5 for Jan.-Feb., Feb. 5 for Mar.-Apr., Apr. 5 for May-June
ADDRESSES: Send all Newsletter material **except ads** to Anne Leggett, Dept. of Math. Sci., Loyola University, 6525 N. Sheridan Rd., Chicago, IL 60626.
Send everything else, **including ads**, to Lori Kenschaft, AWM, Box 178, Wellesley College, Wellesley, MA 02181.

BALLOT FOR AWM ELECTION

President-elect:
(vote for one)

Jill Mesirov

Treasurer:
(vote for one)

Jenny Baglivo

Members-at-Large:
(vote for two)

Ruth Rebekka Struik
 Carol Wood

Ballots are due by December 1, 1987. Send to: AWM, Box 178, Wellesley College, Wellesley, MA 02181.

JOB ADS

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

University of Alabama. Department of Mathematics, Box 1416, Tuscaloosa, AL 35487-1416. Two positions, probably Asst Prof, perhaps higher, to begin 8/16/88. Required: PhD or equivalent by 8/16/88, or reasonable expectation thereof; excellence in both teaching and research. Each position may be filled as tenure track or temporary. Send vita, reprints and/or preprints, and at least 3 letters of recommendation to Search Committee.

University of Alabama. Department of Mathematics, Box 1416, Tuscaloosa, AL 35487-1416. Two-yr instructorship to begin 8/16/88. Masters required. Position is not tenure track, is renewable at most once. Benefits incl health, life, and disability insurance and teacher retirement. Send vita and 3 letters of recommendation about teaching to Instructor Search Committee.

California State University, Los Angeles. Dept of Math & CS, Los Angeles, CA 90032. Wayne Bishop, Chair. Two tenure-track positions in CS at any rank and one in math ed at asst or assoc. Required: PhD in math, CS, or math ed. Strong CS background required; ABD toward PhD in CS will be considered for one year temporary. Also one year visiting position in math with PhD & strong record. Begin 9/88. Salary: \$30,300 - \$57,200 w/ summer employment possibilities. Contact Chair by 2/1/88.

California State University, Long Beach. Dept of Math & CS, Long Beach, CA 90840. C.W. Austin, Chair. Eight tenure track positions to begin Fall 1988: Algebra, Functional Analysis, or Diff Eq (3 positions); Numerical Analysis, applied PDE or applied Probability (2 pos); Statistics (1 pos); Math Education (1 pos); Computer Science (1 pos). Required: PhD, evidence of excellent teaching, strong research record or potential, US citizen or permanent resident. Asst or Assoc Prof preferred; applicants w/ distinguished records in teaching and research may be considered for Prof. Details of duties, salary range, specialty and degree requirements on request. Applicants not selected for tenure track, and appl not meeting specialty or citizen/resident requirement, may be considered for 1 yr appt as Lecturer, but must have visa valid for term of appt prior to offer. Positions open until filled, but selection from complete files (resume, transcript, 3 reference letters) begins 12/1/87 for tenure track, 3/15/88 for Lecturer. Apply to Chair.

Loyola Marymount University. Dept of Math, Los Angeles, CA 90045. Tenure-track Asst Prof position for Fall 1988. May be 1-2 visiting positions. Required: PhD in math (no restriction on area of specialization), willing to teach wide variety of undergrad classes. Load: 9-12 hrs per semester. Applications by 2/1/88 receive full consideration. Send cover letter (indicate whether planning to attend AMS/MAA Annual Meeting in Atlanta), resume, & 3 letters of recommendation (at least 1 on teaching) to Dennis G. Zill, Hiring Committee.

Occidental College. Dept of Math, Los Angeles, CA 90041. One or two regular positions to begin 9/88. One entry level Asst Prof with expertise in CS, excellence in teaching and active research interests expected; other open. Required: PhD in Math Sci. Load: 2 courses per term (8-9 hrs). OC is a liberal arts college offering AB in math w/ optional CS emphasis. Send vita and 3 letters of reference (1 on teaching) to Nalsey Tinberg by 3/1/88. Interviews at AMS meeting in Atlanta in January.

University of California, Berkeley. Dept of Math, Berkeley, CA 95720. Several temporary postdoctoral positions, to begin Fall 1988, for new and recent PhD's of any age, in Algebra, Analysis, Applied Math, Foundations, or Geometry and Topology. Term from 1 to 3 yrs, depending partly on administrative decisions. Applicants for NSF or other postdoctoral fellowships encouraged to apply; combined teaching/research appts possible for up to 3 yrs. Research interests close to dept given some preference. Send resume, reprints, preprints, and/or dissertation abstract, and have 3 letters of recommendation sent to Arthur E. Ogus, Vice Chair for Faculty Affairs, by 1/15/88.

University of California, Berkeley. Dept of Math, Berkeley, CA 95720. One or more tenure-track Asst Prof positions, subject to budgetary approval, to begin 7/1/88, in Algebra, Analysis, Applied Math, Foundations, or Geometry and Topology. Required: demonstrated outstanding research potential, normally incl major contributions beyond doctoral dissertation. Send vitae, list of publications, a few selected reprints or preprints, and have 3 letters of recommendation sent to Arthur E. Ogus, Vice Chair for Faculty Affairs, by 1/15/88.

University of California, Berkeley. Dept of Math, Berkeley, CA 95720. One or more tenured positions (Assoc or Full Prof), subject to budgetary approval, to begin 7/1/87, in Algebra, Analysis, Applied Math, Foundations, or Geometry and Topology. Demonstrated leadership in research expected. Send vitae, publication list, a few selected reprints or preprints, and names of 3 references to Arthur E. Ogus, Vice Chair for Faculty Affairs, by 1/15/88.

University of California, Davis. Davis, CA 95616. Applications and nominations for joint appt in Division of Stats & Dept of Math to begin Fall 1988. Rank and salary commensurate w/ qualifications. Duties include teaching at all levels & research. Required: distinguished research record in probability theory/applied prob/stochastic processes, strong interest in mathematical stats, & excellence in teaching. Vitae & 3 reference letters postmarked by 1/14/88 to Joint Search Committee, Div of Stats.

University of California, Los Angeles. Dept of Math, Los Angeles, CA 90024-1555. Theodore W. Gamelin, Chair. Four or five regular positions in pure mathematics. Specific fields of interest include algebra/number theory, analysis, differential eqs, geometry/topology, logic, probability, and stats. Very strong research & teaching background required. Positions initially budgeted at Asst Prof level. Sufficiently outstanding candidates at higher levels and/or in other fields also considered. Load: avg. 1.5 courses per Quarter, or 4.5 Quarter courses per year. Write to Chair.

University of California, Los Angeles. Dept of Math, Los Angeles, CA 90024-1555. Theodore W. Gamelin, Chair. Two or three regular positions in applied & computational math. Preference to candidates in numerical analysis, mathematical modeling, and scientific/engineering computing. Very strong research & teaching background required. Positions initially budgeted at Asst Prof level. Sufficiently outstanding candidates at higher levels and/or in other fields also considered. Load: avg. 1.5 courses per Quarter, or 4.5 Quarter courses per year. Write to Chair.

University of California, Los Angeles. Dept of Math, Los Angeles, CA 90024-1555. Theodore W. Gamelin, Chair. One or two positions in mathematical computer science. Preference to candidates in analysis of algorithms, coding theory, computational complexity, and theory of programming languages. Very strong research & teaching background required. Positions initially budgeted at Asst Prof level. Sufficiently outstanding candidates at higher levels and/or in other fields also considered. Load: avg. 1.5 courses per Quarter, or 4.5 Quarter courses per year. Write to Chair.

University of California, Los Angeles. Dept of Math, Los Angeles, CA 90024-1555. Theodore W. Gamelin, Chair. Temporary positions. (1) Three ER Hedrick Asst Professorships. Required: strong research promise & PhD in last 3-4 yrs (but any age), no field restrictions. Salary: \$35,800. 3-yr appt. Load: 4 Quarter courses per year, may incl 1 adv course in candidate's field. Deadline 1/1/88. (2) A few adjunct Asst Prof positions, subject to administrative approval. 2-yr appt. Strong research & teaching background, no field restrictions. Salary: \$31,500-\$33,000 for academic year. Load: 5 Quarter courses per year. (3) Several positions for visitors & lecturers. Write to Chair.

University of California, Santa Barbara. Math Dept, Santa Barbara, CA 93106. Alex Rosenberg, Chair. (1) Two-year non-renewable Asst Prof positions with research stipend to begin 7/1/88. Required: Ph.D. by 9/88. Selection primarily on research achievement, teaching experience desirable. Teaching load: 4 one-quarter courses per year. Send vita, publications list, 3 letters of recommendation to Chair by January 11, 1988. (2) Tenure-track Asst Prof position to begin 7/1/88. Required: Ph.D. by 7/88. Junior candidates in all areas of mathematical sciences considered, applied discrete math especially sought. Selection for outstanding research and teaching accomplishments and potential. Send vita, publications list, and 3 letters of recommendation to Chair.

University of California, Santa Barbara. Math Dept, Santa Barbara, CA 93106. Alex Rosenberg, Chair. Four special visiting Asst Professorships, 1988-89. Possibility of 2nd yr. Research and teaching 5 one-quarter courses. Salary approx \$32,600. Required: PhD by 6/30/88, strong promise in research, superior teaching ability, proof of US citizenship or eligibility for employment. Send vitae, publication list, and 3 letters of recommendation to Chair by 1/30/88.

Colorado College. Dept of Math, Colorado Springs, CO 80903. Steven Janke, Chair. Tenure-track position to begin 9/88. Both research and teaching valued. Required: Ph.D. & strong ability and interest in undergraduate teaching. Desirable: ability to teach some computer science. Salary and rank depend on experience. Send vita & 3 letters (2 concerning teaching ability). Review of applications begins 1/4/88, continues until position filled.

University of Colorado at Boulder. Dept of Math, Campus Box 426, Boulder, CO 80309. Positions beginning Fall 1988. Asst Prof preferred, other levels considered for exceptionally strong cases. Preference given to those whose research complements current faculty. Especially soliciting applications from women, ethnic minorities, and disabled individuals. Inquiries to New Appointments; applications completed by 12/31/87.

University of Connecticut. Dept of Math, Stamford Regional Campus. Tenure track position. Required: PhD and some teaching experience. Encouraged: ability to develop and offer introductory graduate courses in applied math. Rank and salary competitive & commensurate with qualifications. Screening begins 12/15/87, continues until position filled. Send vita and at least 3 letters of reference to Prof H. Roberts, Assoc Head, Dept of Math, 196 Auditorium Rd, U-9, U of CT, Storrs, CT 06268.

University of Connecticut. Dept of Math, 196 Auditorium Rd, U-9, Storrs, CT 06268. J. Tollefson, Head. Tenure track and visiting positions to begin Fall 1988. Required: strong research potential and commitment to teaching. Sr level: proven excellence in research and teaching expected. Jr level: postdoctoral experience desirable. Preferred: Differential Eqs, Discrete Math, Dynamical Systems, Mathematical Physics, Probability. Rank and salary competitive and commensurate with qualifications. Screening begins 12/1/87, continues until positions filled. Send vita and 3 letters of reference to Head.

Yale University. Dept of Math, Box 2155 Yale Station, New Haven, CT 06520. Several Gibbs Instructorships for PhDs w/ outstanding promise in research. 2-yr appts to begin 7/1/88. Light load. Salary at least \$30,000. Applications & supporting materials should be received by 1/15/87; offers made about 2/1/87. Request application from Gibbs Committee.

National Science Foundation. Division of Mathematical Sciences, Washington DC. Deputy Director, DMS. Division responsible for funding research in Algebra, Number Theory, Applied Math, Classical Analysis, Modern Analysis, Stats & Prob, Topology & Foundations, Geometric Analysis, Computational Math, and Special Projects. Appt to this Senior Executive Service position may be on career or 1-3 yr limited term basis w/ salary from \$64,700 (ES-1) to \$73,400 (ES-4). Or assignment may be made under Intergovernmental Personnel Act. Required: PhD or equivalent professional experience or combination of education & experience in math sciences or related field; substantial research contributions & strong evidence of scholarship in math sciences, incl publication of research; demonstrated familiarity w/ academic community & recognized professional standing in scientific/engineering community; supervision & management of professional & support staff. Contact Margaret Cademartori at (202) 357-7601 (TTD (202) 357-7492) for Announcement EP 87-8 (career appt), EP 87-18 (term appt), or EP 87-28 (IPA), complete requirements, and application procedures. Applications must be received by 1/8/87.

Florida State University. Math Dept, Tallahassee, FL 32306-3027. Two tenure-track positions to begin 8/88. Ralph D. McWilliams, Chair. Preference for analysis or applied math, but well qualified candidates in all areas encouraged to apply. Required: excellent research programs and excellent teaching ability. Salary competitive. Send resume and 3 letters of recommendation to Chair by 1/12/88.

University of Florida. Dept of Math, 201 Walker Hall, Gainesville, FL 32611. Gerard G. Emch, Chair. Dept in 2nd yr of 5-yr program to fill over 20 new tenure track positions w/ mathematicians of exceptional caliber. At least 1/3 senior positions. Six positions in Fall 1988, at least two senior appts. Sr candidates chosen will have role in selecting jr candidates. Dept especially interested in Algebra (esp Group Theory & Algebraic Geometry), Mathematical Physics (& related areas), Algorithms (incl Numerical Analysis & Combinatorics). Required: strong research potential & documented interest in teaching. Preference to candidates w/ at least 2 yrs post-PhD experience. Rank and salary commensurate w/ experience and achievements. Send resume, incl list of publications, and at least 3 letters of recommendation to Chair by 12/31/87.

Emory University. Dept of Math & CS, Atlanta, GA 30322. Three positions in math to begin 9/1/88. Tenure track Asst Prof, or higher for exceptional candidate. Required: PhD in math and strong record (or promise) of research. Preferred: Geometric Analysis, Numerical Analysis, Combinatorics, Applied Math (Differential Eqs). Other areas considered. Dept has 20 permanent members w/ several active research groups. Grad program offers PhD in math and master's degrees in math & CS. Load: 6 hrs per week, incl grad and undergrad. Salaries competitive and commensurate with experience. Send vita and names of references to Peter Winkler; have references forwarded. Screening begins 2/1/88.

Georgia State University. Dept of Math and CS, University Plaza, Atlanta, GA 30303-3083. (1) Tenure track position to begin 9/88. Rank and salary commensurate with qualifications and experience. Required: PhD in math with strong research potential and commitment to teaching. Preference to Graph Theory and Matrix or Linear Algebra. Duties: teaching, research, and service to support BS & MS degrees in math & CS. (2) Tenure track position to begin 9/88. Rank and salary commensurate with qualifications and experience. Required: PhD with strong research potential in and commitment to teaching in CS. Preference to all aspects of CS, esp Theoretical CS, Artificial Intelligence, Operating Systems, Software Engineering, Data Communications, Networking, and Analysis of Algorithms. Duties: teaching, research, and service to support BS & MS degrees in math & CS. Send letter of application, vita without birthdate but with citizenship status, 3 letters of reference, and transcripts of all undergrad work to Chair, postmark By 1/29/88.

University of Hawaii at Manoa. Dept of Math, 2565 The Mall, Keller 401A, Honolulu, HI 96822. Ronald Brown, Chair. Positions to begin Fall 1988, up to 3 tenure track. Rank open. Duties: research and teaching 6 credit hours per semester. Required: PhD, commitment to research and teaching, achievement appropriate to rank. Research interests complementing dept desired. Salary range as of 10/88 is \$25,368 (min Asst Prof) to \$57,804 (max Full Prof). Write to Chair and have 3 references send confidential letters directly to Chair by 1/18/88.

Boise State University. Dept of Math, Boise, ID 83725. Charles Kerr, Chair. Tenure track position to begin 8/22/88, rank and salary dependent on qualifications. Required: PhD. Duties: teaching normal range of undergrad math courses, avg 12 hours per semester. All areas of math encouraged to apply. Dept offers BS in math with CS option, and in math for secondary education. Send letter of application, resume, grad transcripts, and 3 letters of reference to Chair. Screening begins 2/1/88, continues until position filled.

Southern Illinois University at Carbondale. Dept of Math, Carbondale, IL 62901. Ronald B. Kirk, Chair. Tenure track position to begin 8/16/88. Required: PhD in math, strong background in pure or applied Combinatorics, Graph Theory, or Combinatorial Designs, demonstrated excellence in research or potential for such, evidence of teaching effectiveness. Rank open; substantial published research required for non-entry appt. Send letter of application, resume, and 3 letters of recommendation to Discrete Math Position, c/o Chair. Closing date 12/15/87 or until position filled.

Western Illinois University. Dept of Math, Macomb, IL 61455. Larry Morley, Chair. Two or more tenure-track Asst/Assoc Prof positions to begin 8/22/88, subject to budget approval. Required: PhD in math sciences, strong commitment to excellent teaching, established record or high potential in research. Load: 8-10 semester hours. Competitive salary and benefits. Selection begins 11/15/87. Send vitae, photocopies of grad transcripts, and at least 3 letters of recommendation to Chair.

Western Illinois University. Dept of Math, Macomb, IL 61455. Larry Morley, Chair. Asst Prof or instructor position to begin 8/22/88, subject to budget approval. Earned doctorate with emphasis in learning theory and the teaching of math preferred. Duties incl combination of teaching and research in connection with developmental mathematics program. Competitive salary. Selection begins 11/15/87. Send resume, photocopies of grad transcripts, and at least 3 letters of recommendation to Chair.

Indiana University-Purdue University at Indianapolis. Indianapolis, IN 46202. Dean, School of Science. Nominations and applications solicited. Duties: administering School, strengthening undergrad and grad programs, developing new relationships with other campus units. Qualifications: established record of research, scholarship, funding and teaching appropriate for Full Prof; communication and interpersonal skills for relating effectively w/ varied constituencies within the School, the University, industry, the Indianapolis community, and funding agencies; successful administrative leadership at level of dept chair or higher; understanding of the requirements of laboratory research. Screening began 10/5/87. Contact William M. Plater, Chair, Search Committee for Dean of Science, Administration Building, 355 North Lansing; 317-274-4500.

Purdue University. Dept Math Sciences, IUPUI, 1125 E 38th St, PO Box 647, Indianapolis, IN 46223. Bart Ng, Chair. Two tenure track positions to begin 8/88. Required: earned PhD, research record, excellent potential. Some preference to Computational and Applied Mathematics, Applied Geometry, Functional Analysis, and Operator Algebras; strong applicants in other areas of pure and applied math also considered. IUPUI is a comprehensive urban university with over 23,000 students. Dept offers BS, MS, and PhD degrees from Purdue U. Load: 2 courses per semester. Excellent benefits and competitive salary. Send resume and 3 letters of recommendation to Chair. Closing date 1/15/88 or until position filled.

Purdue University. Dept of Math, West Lafayette, IN 47907. Joseph Lipman, Head. Possible position at Assoc Prof/Prof level to begin 8/88. Excellent research credentials required. Send resume and 3 letters of recommendation.

Purdue University. Dept of Math, West Lafayette, IN 47907. Joseph Lipman, Head. Several regular or research Asst Prof positions to begin 8/88. Exceptional research promise and excellence in teaching required. Send resume and 3 letters of recommendation.

Iowa State University. Dept of Math, Ames, IA 50011. K.A. Heimes, Chair. One or more tenure track positions, Asst Prof or above, to begin 8/21/87. Number of positions and salary depend on qualifications and funding availability. Preferred: Applied Math and Numerical Analysis. Other areas of interest: Discrete Math, Math Ed, Partial Differential Eqs, Stochastics/Biomathematics. Required: PhD or equivalent, good communication skills, potential for excellence in teaching and research. For senior positions: Applied Math or Numerical Analysis and interest in long-term interactions with interdisciplinary projects. Preferred: knowledge of asymptotic and numerical techniques applied to nonlinear and time-dependent phenomena in continuum theories of fluids and solids. Send letter of application, vitae, and 3 letters of reference to Chair. Applications for sr positions should be received by 12/1/87 and jr 1/15/87. Late appl considered until position(s) filled.

University of Kansas. Dept of Math, Lawrence, KS 66045-2142. C.J. Himmelberg, Chair. Tenure track and temporary positions at all levels, to begin 8/16/88 or as negotiated. Field unrestricted, preference to Algebra, Combinatorics and Numerical Analysis, and areas meshing well w/ dept's needs. Required: PhD, or dissertation accepted with only formalities to be completed. Send application, detailed resume w/ description of research, and 3 recommendation letters to Chair. Deadline 12/1/87 for first consideration, then monthly until 8/1/88.

University of Kansas. Dept of Math, Lawrence, KS 66045-2142. C.J. Himmelberg, Chair. Instructorships to begin Fall 1988, normally renewable for 2nd & 3rd yr. Salary to be determined. Required: research interests close to current staff, PhD or dissertation accepted with only formalities to be completed. Send detailed resume and dissertation abstract, have 3 letters of reference sent directly to Chair. Deadline 12/1/87; then monthly until 8/1/88.

University of Louisville. Dept of Math, Louisville, KY 40292. Dept Chair. Seek established mathematician with active research program, substantial scholarly achievement, teaching and administrative experience, and interest in both undergrad & grad program development. PhD in math required. Research areas compatible with those already in Department desired, not required. Experience directing PhD theses desirable, not essential. Appt at Assoc Prof or Prof level, depending on qualifications. Send application, vitae, and at least 3 letters of recommendation to Search Comm Chair by 1/4/87.

University of Louisville. Dept of Math, Louisville, KY 40292. George R. Barnes, Asst Chair. Two tenure-track asst professorships. Required: active research program in analysis, probability, statistics, algebra, or their applications; PhD in math science by 8/88; teaching experience in some form strongly preferred. Send letter of application, vitae, at least 3 letters of recommendation, and official transcript to Asst Chair. Consideration begins 1/1/87 and continues until positions filled. Interviews at AMS Meeting in Atlanta.

University of Maryland, Baltimore County. Dept of Math & Stat, Catonsville, MD 21228. James M. Greenberg, Chair. Tenure and tenure track positions in applied math to begin 9/1/88. Required: PhD and research and teaching experience commensurate w/ position. Preferred areas: Combinatorics, Control & Communication, Operations Research, Scientific Computing, and Applied Analyses. Dept currently has 25 faculty. Applications should be received at early date, no later than 1/15/88. Send vitae, reprints and/or preprints, names of at least 3 references, and summary of recent research activity to Chair.

University of Maryland, Baltimore County. Dept of Math & Stat, Catonsville, MD 21228. James M. Greenberg, Chair. Tenure and tenure track positions in statistics to begin 9/1/88. Required: PhD, strong teaching ability, demonstrable research potential in either mathematical or applied statistics. Dept offers MS & PhD programs in applied math and stats, and undergrad major in math. Dept currently has 25 faculty. Applications should be received at early date, no later than 1/15/88. Send vitae, reprints and/or preprints, names of at least 3 references, and summary of recent research activity to Chair.

University of Maryland, College Park. Dept of Math, College Park, MD 20742. Applications invited for possible tenure or tenure-track positions to begin in August 1988. Rank and salary depend on qualifications. Joint appointments with other units are possible. Exceptionally strong research program necessary. Deadline for full consideration is February 1, 1988. Vita, description of research, and at least 3 letters of recommendations should be sent to Prof. Nelson G. Markley, Chair.

Brandeis University. Dept of Math, Waltham, MA 02254. Pending University funding, several visiting and Asst Prof positions in pure math to begin 9/88. Load: 6 hrs/wk. Required: PhD and demonstrated excellence in teaching and research. Send vitae and letters of recommendation by 1/15/88 to Edgar Brown, Jr., Hiring Comm Chair.

Smith College. Dept of Math, Northampton, MA 01063. Tenure track Asst Prof position to begin Fall 1988. Load: 3-2 with one course each semester at jr/sr level. Evidence of outstanding teaching and scholarship potential required. Send vitae, supporting documents, and at least 3 letters of reference to Kathy Bartus, Dept Secretary, by 1/20/87.

Worcester Polytechnic Institute. Dept Math Sci, 100 Institute Rd, Worcester, MA 01609. Samuel M. Rankin, Chair. Several tenure track positions at all levels for Fall 1988. Possibility of position beginning Spring 1988. Required: strong research record or potential and evidence of quality teaching. Fields of interest are numerical analysis, computational fluid mechanics, nonlinear PDE, optimization, control theory, dynamical systems, applied discrete math, stats/applied prob. WPI, the 3rd oldest college of science & engineering in US, offers degrees through PhD. Dept offers undergrad & masters degrees in applied math. Worcester is 2nd largest city in New England, 40 mi west of Boston. Send vitae to Chair. Applications accepted until positions filled.

Michigan State University. Dept of Math, East Lansing, MI 48824-1027. Kyung Whan Kwun, Chair. Several tenure track Asst, Assoc, and possibly Full Prof positions in all fields w/ emphasis on numerical analysis, differential geometry, and math ed. Excellence in teaching and research essential. Send resume and 3 letters of recommendation to Chair. Applications before 1/3/88 receive more attention.

Michigan State University. Dept of Math, East Lansing, MI 48824-1027. Kyung Whan Kwun, Chair. Two postdoctoral fellowships, 2 yr appt. Duties: 1 course per term, remaining time for research. Normally offered to persons (regardless of age) with PhD of less than 2 yrs. Also some instructor positions. Send resume and 3 letters of recommendation to Chair. Applications before 1/3/88 receive more attention.

Oakland University. Dept Math Sci, Rochester, MI 48063. E.G. Malm, Chair. One yr visiting position to begin Fall 1988. Visiting positions also anticipated in future years. Level depends on qualifications. Required: PhD with excellent record or strong potential in research. Preference to research interests coinciding with those of dept. Load: 2 courses per semester. OU is a state-supported university w/ 12,000 students 30 miles from Detroit. Dept strongly committed to research, offers master's degrees in math sciences, incl statistics. Send resume and 2 letters of reference to Chair. Full attention to appl before 1/30/88, late appl considered if position not filled.

Oakland University. Dept Math Sci, Rochester, MI 48063. E.G. Malm, Chair. Tenure track and visiting statistics positions to begin Fall 1988. Level depends on qualifications. Required: PhD and strong commitment to quality research and excellent teaching. Active involvement w/ local industry, esp Ford Motor Co, provides many consulting opportunities. Load: 2 courses. Dept offers BS and MS degrees in statistics. Send resume, transcript, and 2 letters of reference to Chair. Full attention to appl before 1/30/88, late appl considered if position not filled.

Oakland University. Dept Math Sci, Rochester, MI 48063. E.G. Malm, Chair. One or more tenure track positions to begin Fall 1988. Required: PhD with demonstrated record or strong potential in research. Preference to research interests coinciding with those of dept. Load: 2 courses per semester. OU is a state-supported university w/ 12,000 students 30 miles from Detroit. Dept strongly committed to research, offers master's degrees in math sciences, incl statistics. Send resume and 2 letters of reference to Chair. Full attention to appl before 1/30/88, late appl considered if position not filled.

University of Michigan. Dept of Math, Ann Arbor, MI 48109-1003. D.J. Lewis, Chair. Three or more tenured positions or senior Asst Prof tenure track positions to begin 9/88. Areas not specific, but special consideration to K-theory, Combinatorics, Representation Theory, Differential Geometry, and Applied Math. Required: exceptional research and teaching. Salary negotiable. Applications considered on a continuing basis.

University of Michigan. Dept of Math, Ann Arbor, MI 48109-1003. D.J. Lewis, Chair. Two T.H. Hildebrandt Research Asst Professorships, 3 yr appt to begin 9/88, reduced teaching load. Preference to persons of any age with PhD of less than 2 yrs. Also expect to have several 3 yr terminal Asst Prof positions. Area not specific. Seek strong research program and serious commitment to teaching. Salary competitive, possibility of additional summer income. Deadline: 1/6/88.

Carleton College. Dept of Math & CS, Northfield, MN 55057. David Appleyard, Chair. Two tenure-track positions to begin 88-89. Ph.D. required. Six courses a year in math, CS, and/or statistics. Excellent teaching ability essential; research encouraged. Interviewing at MAA/AMS meeting in Jan. Deadline Jan 18; applications accepted until position filled. Applications specifically invited from women and minorities. Send letter of application, resume, graduate transcript, and 3 recent letters of recommendation to Chair.

Macalester College. Math/CS, St Paul, MN 55105. John Schue, Chair. Two tenure track positions in math (subject to administrative approval) to begin 9/88. Required: PhD in math and interest in teaching and research in 4-yr liberal arts college. Load: 6-9 hrs/wk. Competitive salary, good benefits, urban residential location. Send resume and three references to Chair by 2/1/88.

Moorhead State University. Math Dept, Moorhead, MN 56560. Milton Legg, Chair. Tenure track Asst or Assoc Prof position to begin 9/88. Required: PhD in math. Preference to candidates w/ succesful college teaching experience. Duties: teaching undergrad math courses, advising students, university & dept committee work. Screening begins 2/15/88, applications accepted until positon filled.

University of Minnesota, Duluth. CS Dept, Duluth, MN Two Asst, Assoc, or Full Prof positions (tenure available at sr ranks) for Fall 1988. Duties: 2 grad or undergrad CS courses per qtr or grad thesis supervision, conduct research. Required: PhD in CS or closely related area together w/ master's degree or two yrs experience in CS (additional requirements for sr ranks); demonstrated evidence of effective teaching & communication skills appropriate to a faculty position. Send letter of application, resume, official transcripts, and 3 letters of reference to Keith Pierce by 1/31/87.

University of Minnesota, Minneapolis. School of Math, 127 Vincent Hall, 206 Church St SE, Minneapolis, MN 55455. Richard McGehee, Head. Dunham Jackson Instructorship. Three year appt from Fall 1988 to Spring 1991 with reduced teaching load of 1 course per quarter. Required: PhD no earlier than 1/87, outstanding research and teaching abiliites. Preference to research interests compatible with those of School. Summer School teaching available summers 1989 and 1990. Salary competitive. Contact Head. Screening begins 12/1/87.

University of Minnesota, Minneapolis. School of Math, 127 Vincent Hall, 206 Church St SE, Minneapolis, MN 55455. Richard McGehee, Head. Several visiting positions at all levels from Lecturer to Full Prof, for one quarter to one year in 1988-89. Required: strong research and teaching abilities. Preference to research interests compatible with those of School. Salary competitive. Contact Head. Screening begins 12/1/87.

University of Minnesota, Minneapolis. School of Math, 127 Vincent Hall, 206 Church St SE, Minneapolis, MN 55455. Richard McGehee, Head. One or more tenure track positions to begin Fall 1988 may be available. Required: outstanding research and teaching abilities. Appl at all levels invited, preference to Asst Prof or beginning Assoc Prof. Preference to research interests compatible with those of School; Several Complex Variables of particular interest. Salary competitive. Contact Head. Screening begins 12/1/87.

University of Nebraska, Lincoln. Dept of Math & Stat, Lincoln, NE 68588-0323. (1) Two tenure track Asst Prof positions. Required: PhD, potential for excellent teaching, strong research in area compatible w/ dept research interests. (2) One tenure track Assoc or beginning Full Prof position in statistics. Required: PhD and established, strong research program w/ good teaching, commitment to strengthening existing PhD program. Positions begin Fall 1988. Send vita and 3 letters of reference to Chair, Search Comm, by 1/25/88, or until suitable candidate applies.

Dartmouth College. Dept of Math & CS, Hanover, NH 03755. John Wesley Young Research Instructorship. Two yr post-doctoral appt for new or recent PhD's whose interests overlap with those of a dept member. Teaching: 4 10-wk courses spread over 2 or 3 quarters. Nine-month salary: \$27,000; \$6000 summer research stipend. Send letter of application, resume, graduate transcript, thesis abstract (and description of other interests if appropriate), and 3 or preferably 4 letters of recommendation to Recruiting Committee. Applications by 1/31 receive first consideration.

Rutgers University. Dept of Math & CS, Smith Hall, Newark, NJ 07102. J. Gilman, Chair. Possible tenure track and tenure openings as well as some visiting positions. Rank, salary, teaching load negotiable. Some Henry Rutgers Research Fellowships may be available for Asst Profs. Required: strong research accomplishments or potential. Sent vita and at least 3 letters of recommendation to Chair. Deadline 1/15/88, late appl considered until position filled.

Rutgers University. Stat Dept, Hill Ctr, Busch Campus, New Brunswick, NJ 08903. 201-932-2692. One Asst Prof & one senior Prof position in stats and biostats for Fall 1988. Asst candidate to have PhD before 12/88. Duties: undergrad & grad courses; possibility of statistical consulting; research leading to publication in refereed journals. Sr candidate to have outstanding research & teaching background. Send vita and 3 letters of recommendation to Chair.

Marymount College. Dept of Math & CS, Tarrytown, NY 10591. Doris Appleby, Chair. Tenure track specialist in remedial math to begin 9/88 (subject to budget approval). Duties: 9 hrs teaching through calculus each semester and supervision of developmental program. Required: PhD, or near completion. Send graduate transcript and 3 reference letters to Chair by 3/1/88.

New Mexico State University. Dept Math Sci, Box 30001, Las Cruces, NM 88003. Carol L. Walker, Head. Visiting positions and possible tenure track Asst Prof positions in pure & applied math, numerical analysis, stats, computer vision. Start 8/22/88. Salary competitive. Required: PhD (or equivalent) and strong commitment to teaching & research. Applications kept on file through hiring period & positions filled as openings occur. Send vita and 3 reference letters to Head.

University of North Carolina, Chapel Hill. Math Dept, Box 3250, Chapel Hill, NC 27514. Tenure track positions to begin Fall 1988. Rank and salary dependent on qualifications and budget considerations. Required: PhD, exceptionally strong research program, commitment to excellent teaching. Encouraged: strong component of computational and applied math in research and teaching. Send 4 letters of recommendation, vitae, and abstract of current research program to Chair. Women and minorities encouraged to identify themselves voluntarily. Completed applications before 1/15/88 assured of full consideration.

University of North Carolina, Chapel Hill. Stat Dept, Box 3250, Chapel Hill, NC 27514. One tenure track Asst Prof joint appt in math and stat in any area of common interest to both depts. Search provisional, contingent on availability of funds. Send vitae, 4 letters of reference, and abstract of current research program to Math-Stat Search Comm. Applications by 1/15/88 assured of full consideration.

Case Western Reserve University. Dept of Math & Statistics, Cleveland, OH 44106. W.A. Woyczynski, Chair. Tenure-track, possibly senior, positions to begin 8/15/88. Required: outstanding research record and/or proven research potential and teaching excellence. Preferred areas: statistics and numerical methods. Global analysis, dynamical systems, control theory, probability, and functional analysis also considered for jr positions. Visiting positions most likely in applications of probability and graph theory to chemistry. Send vita & 3 letters of recommendation to Chair.

Kenyon College. Math Dept, Gambier, OH 43022. Two tenure track positions to begin 1988-89. One Asst Prof or beginning Assoc Prof, other Asst Prof. Required: PhD by 8/88, broad background in math, strong commitment to undergrad teaching. For one position, preference for prob/stats. Some background in CS or Numerical Analysis or Combinatorics or Modeling is an asset. Load: 3 courses per semester. Write to Stephen Slack or call 614-427-5267 promptly for more information. Candidates considered until position filled. Interviews at Jan AMS/MAA meeting in Atlanta.

Kenyon College. Math Dept, Gambier, OH 43022. Two year sabbatical replacement position to begin 1988-89. Inst or Asst Prof. Required: Masters in math by 8/88, PhD preferred; broad background in math; strong commitment to undergrad teaching. Background in CS or Numerical Analysis or Combinatorics or Modeling is an asset. Load: 3 courses per semester. Write to Stephen Slack or call 614-427-5267 promptly for more information. Candidates considered until position filled. Interviews at Jan AMS/MAA meeting in Atlanta.

Miami University. Dept of Math & Stat, Oxford, OH 45056. John Skillings, Acting Chair. Authorization of following positions to begin 8/88 anticipated: (1) Asst Prof, tenure track at Oxford campus. Required: PhD in stats, genuine interest and promise in teaching stats, research ability. Interest in consulting desirable. Duties: teaching 8-9 hrs per semester, scholarship, and service. (2) Asst Prof, tenure track at Middletown campus (a 2 yr regional campus). Required: PhD in math, math ed, or stats. Duties: teaching 12 hrs per semester, service, and scholarship. Teaching experience desirable. (3) Instructor at Middletown campus. Required: Masters in math, math ed, or stats. Duties: teaching 12 hrs per semester and service. Send vita, graduate transcript, and 3 reference letters to Chair.

Ohio State University. Dept of Math, 231 W 18th Ave., Columbus, OH 43210. Joseph Ferrar, Chair. Several positions, visiting and permanent, Autumn Quarter 1988. All areas of applied and pure math. Significant research accomplishments or exceptional research promise, and evidence of good teaching ability, expected. Send credentials and letters of recommendation. Review of resumes begins immediately.

York University. Dept of Math, 4700 Keele St, North York, Ontario M3J 1P3 Canada. Joan Wick Pelletier, Chair. Tenure track position in statistics, rank open, to begin 7/1/88. Required: proven ability or demonstrated potential for research and ability to teach applied stats at undergrad and grad levels. One or more limited term or tenure track positions, rank and field open, also anticipated, subject to university approval. Send resume and 3 letters of recommendation by 1/1/88 to Chair. Advertisement directed to Canadian citizens and permanent residents.

Indiana University of Pennsylvania. Dept of Math, Indiana, PA 15705. Tenure track position at Asst/Assoc Prof rank to begin 9/88. Duties: teach undergrad and grad courses, w/ emphasis on operations research or applied math; provide leadership in implementation of newly designed MS program in applied math; give direction to a grad internship program and to grad student projects in applied math; participate in other academic & professional activities of dept & discipline. Required: PhD in applied math or PhD in math w/ experience in operations research or applied stats. Teaching and/or field experience preferred, but not required. Send letter of application, resume, transcripts, and 3 letters of reference to Search Committee A. Review begins on 1/10/88, continues until position filled.

Lehigh University. Dept of Math, Building #14, Bethlehem, PA 18015. At least one tenure track position to begin Fall 1988. Applications in Geometry, Algebra, Analysis, Numerical Analysis, and Applied Math will be considered, preference to research interests that best complement dept activities. Load: approx 6 hrs/wk. Required: strong commitment to and demonstrated excellence in both teaching and research. Send vitae and have letters from 3 references sent to G.T. McAllister, Chair, Search Committee.

University of Pennsylvania. Dept of Math, Philadelphia, PA 19104-6395. Tenure positions anticipated in algebra, analysis, geometry/topology, and discrete math. Start 7/1/88. For candidates with outstanding, internationally recognized research achievements who are successful teachers of undergrad and grad students. Rank and salary depend on experience. Write to Personnel Comm.

University of Pennsylvania. Dept of Math, Philadelphia, PA 19104-6395. Junior positions beginning 7/1/88. Required: strong research credentials, recognition as potentially successful teacher of undergrad and grad students. Send resume and 3 letters of reference to Personnel Comm by 1/11/88.

College of Charleston. Math Dept, Charleston, SC 29424. W.L. Golightly, Chair. At least three tenure track Asst Prof positions to begin Fall 1988. Required: PhD in math sci, commitment to undergrad teaching, potential for continuing research. Load: 9 hrs/wk. Salary competitive. Send resume and have 3 letters of recommendation sent to Chair.

University of Tennessee, Knoxville. Dept of Math, 124 Ayres Hall, Knoxville, TN 37996-1300. John S. Bradley, Head. Tenure track and visiting positions at all ranks in or related to algebra, analysis, integral eqs, mathematical ecology, numerical analysis, ordinary and partial differential eqs, probability, statistics, topology. Priority to analysis, numerical analysis, and topology. Send vita to Head.

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