

Association for Women in Mathematics

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NEWSLETTER

November-December 1986

PRESIDENT'S REPORT

As we move along into the fall, the issues raised at the AWM panel this summer at the ICM-86 don't go away. I have written to Prof. Faddeev, President of the International Mathematical Union, asking that women be included at high levels of administration in the organization. Another issue which came up at the panel was that of the situation in France, in which the merging of the Ecoles Normales for boys and girls has destabilized the relative numbers of male and female students in mathematics. Lack of information and time made it impossible for AWM to do anything but make a gesture of support to those working on the problem. Members who want further information and who have ideas and suggestions should send them along to Marie-Francoise Coste-Roy, Universite de Rennes I, 35042, Rennes, France.

FUNDING ISSUES

Funding for mathematics is very central to the health of our profession. The David Report told us what we all knew: mathematics had been under-funded for years. The new funding which has become available however, is raising controversy. A symposium was held in Berkeley during the International Congress on the effect of military funding on mathematics. Six panelists expressed views which ranged from an enthusiasm for the good such funding can do to a fear that any military funding is inherently dangerous and should be rejected. There will be a panel in San Antonio on the same subject. It is important that this dialog between members of the profession and their leadership continue.

JANUARY MEETING IN SAN ANTONIO

President-elect Rhonda Hughes is organizing a panel titled "Responses to the David Report: Initiatives for Women and Minorities". Panelists so far include John Polking, Louise Raphael and Fern Hunt. Contrary to the announcement in the October NOTICES, the panel will be held Wednesday, Jan. 21, 1987 from 3:20 PM to 4:20 PM. The Emmy Noether Lecturer will be Prof. Joan Birman of Columbia University. Her lecture will be Thursday, Jan. 22, 1987, at 9:00 AM.

AMS-MAA-ASA-IMS-SIAM-NCTM JOINT COMMITTEE ON WOMEN IN THE MATHEMATICAL SCIENCES

Prof. Bhamu Srinivisan, University of Illinois at Chicago, has been appointed to this committee to represent the AMS. She requests members to send her issues for the committee to consider. Write her at: Department of Mathematics, University of Illinois at Chicago, Chicago, IL 60680.

HONORS AND AWARDS

Olga Taussky-Todd of the California Institute of Technology has recently been elected a Fellow of the AAAS in recognition of her work in number theory in the areas of class field theory and integral matrices. Congratulations!

Arlene S. Chasek, program specialist at the Consortium for Educational Equity at Rutgers the State University of New Jersey in New Brunswick, has been named 1986 curriculum award winner for outstanding achievement in the field of education for her work on *FUTURES UNLIMITED*, a widely acclaimed set of materials (print and video) designed to encourage females to consider nontraditional careers in math, science and technical fields. The award, presented at the annual meeting of the American Educational Research Association in San Francisco, California, April 18, 1986, was one of three given for outstanding achievement in research, materials development and policy.

FUTURES UNLIMITED began as a series of conferences designed to address the problem of the scarcity of females in nontraditional math-based careers. Targeting female students in grades 7 through 12, these conferences introduced students to labor force trends, new careers, nontraditional role models, and new technologies in an effort to widen their understanding of the world of work and to demonstrate the vital connection between high school mathematics and exciting careers.

The project's goal has been for female students to base their vocational choices on their interest and abilities, not on their gender, and for these students to recognize the need for mathematics, especially Algebra I, in the skilled trades and technologies. The conference model encourages students to take more math and science courses by scheduling "hands-on" experiences in the school or college laboratories and to meet with successful female role models in math-based careers in a small group setting.

Eleven of the nontraditional role models who participated as career speakers in the conferences are featured in two 29-minute videotapes: *FUTURES UNLIMITED I: Expanding Your Horizons in Mathematics and Science* portrays six college graduates in nontraditional math-based careers; *FUTURES UNLIMITED II: Expanding Your Horizons in Technical and Vocational Education*, profiles five women working in skilled trades and technical fields.

In addition, a *FUTURES UNLIMITED: Real People, Real Jobs* color poster set, photographed by Lowell Handler, further demonstrates visually the expansion of nontraditional career options by highlighting 10 more role models who had participated in the conferences working on-site in technologies and skilled trades.

Finally, a *FUTURES UNLIMITED: Expanding Choices in Nontraditional Careers* handbook provides conference planners with step-by-step instructions in how to plan, conduct, and evaluate the *FUTURES UNLIMITED* conference model.

The *FUTURES UNLIMITED* project was funded by the New Jersey State Department of Education, Division of Vocational Education, with contributions from AT&T Bell Laboratories; Digital Equipment Corporation; Ethicon, Inc.; E. R. Squibb & Sons, Inc.; New Jersey Bell; People's Express Airlines; Public Service Electric & Gas; Hoffmann-LaRoche, Inc. and Rutgers University, Office of Television and Radio.

Ms. Chasek received her B.A. degree from Cornell University and a M.A. in English Literature from Columbia University and has been a member of the Consortium for Educational Equity staff at Rutgers University for five years. She lives in New Providence, New Jersey.

excerpts from the column "Your Children" by Prucia Buscell, Asbury Park Press, Sunday, June 29, 1986
"Pleasing males affects girls' math"

Many adolescent girls fear mathematical ability will brand them as boring and "brainy" and make them unpopular, educator Arlene S. Chasek says.

Girls generally do better than boys in mathematics in the early elementary years, she says, but their math performance falls behind boys in junior and senior high school.

While psychologists and educators are still studying the reasons, Ms. Chasek, a program specialist at the Consortium for Educational Equity at Rutgers, thinks the problem is at least partly based in the female perception of the male ego.

...

Ms. Chasek directs Futures Unlimited, a project designed to make girls aware that math is useful in daily life and future careers. The idea is to prevent immature choices based on stereotypical thinking.

...
Ms. Chasek says she thinks boys and girls need four years of high school math, and thinks girls would be helped if fewer science courses were elective.

...
“A physicist I spoke with recently thinks a girl’s attitude toward math and science careers is set by age 5,” she says. “Girls are supposed to be cute, and to watch, and much that we see in school and in the media reinforces that image.”

...
But most important, she says, is for parents to work with their children. Take them places where they will see science at work, she says; let them see that arithmetic isn’t just a dry exercise in a workbook, but a tool used by cooks, builders, artists and craftsmen.

ETHICAL PROBLEMS IN MATHEMATICAL LIFE: part 3 of 3

Edited version of panel talk, “Ethical Problems in Mathematical Life,” Laramie, Wyoming, August 12, 1985. Transcription by Margaret Munroe, Ruth Rebekka Struik, and Anne Leggett from tape provided by Struik.

Marian Pour-El, University of Minnesota

All of us are familiar with the Equal Rights Amendment. Let us recall the precise wording: “Equality of rights under the law shall not be denied or abridged by the United States or by any state on account of sex. The Congress shall give the appropriate legislation for these provisions. This amendment shall take effect two years after the date of ratification.”

As a statement, the Equal Rights Amendment is quite mild. The language is not at all threatening. No doubt most of you here believe that, if a colleague has even the slightest respect for a woman’s mathematical ability, he would be in favor of — or, at least, not opposed to — the Equal Rights Amendment. I am sorry to say that you are mistaken. In this regard, let me share with you some of my experiences over the years.

In 1964, many years before the advent of the current women’s liberation movement, I received a tenured appointment from the University of Minnesota. My then chairman of the department was very happy to have me come. Over the years there emerged a bond of mutual respect for each others’ abilities — mathematical and otherwise. Therefore, it was quite a surprise when, several years ago, he admitted that he was opposed to the Equal Rights Amendment. My first reaction was one of disbelief. After all, hadn’t he hired me before the women’s liberation movement began? There was no affirmative action program in 1964.

Let me give a second example. In 1977-78 I began a collaboration with an analyst. The reason for the collaboration was quite simple. The computer revolution is upon us, and I was interested in investigating the computability or noncomputability of the standard processes in analysis and physical theory — e.g., solutions of the wave, heat and Laplace equations; Fourier series and transform, etc. Now an analyst often talks about computing a solution, but he doesn’t have the precise definition of computability. I, as a mathematical logician, trained in recursive function theory (the theory of computability), have these techniques. So we began working together.

Let me say a few words about the nature of our collaboration. It is both fruitful and long-lasting. In fact it is still continuing. We have published about ten papers, and at present, we are working on a research monograph to be published by Springer-Verlag. Now a fruitful, long-lasting interaction is usually built upon mutual respect among the participants. That is certainly true in our case. Nevertheless, my collaborator is opposed to the Equal Rights Amendment.

Why is it that so many of our colleagues, who look with favor upon the mathematics of women, are opposed to the ERA? I asked my ex-chairman to explain his position. Unfortunately he felt too embarrassed to discuss the matter with a woman. Then I asked my collaborator for his point of view. Here is his answer.

My collaborator believes in the traditional order of things and in the traditional framework. In particular, he worries that, if the ERA were passed, women would have to be drafted into the Armed Forces. He regards this as a catastrophe, as the natural E^{lan} among men would be destroyed in the presence of women, and they would not be an effective fighting force. Thus our country would have problems in surviving, according to him.

My collaborator's views on working women are equally conservative. He is willing to accept a highly motivated woman, and judge her on her merit. (I suspect that I have had some influence on him over the years!) Nevertheless, he regards the occupation of "full-time housewife" as a proper goal for almost all women.

It seems to me that there is one obvious reason why some of our colleagues respect us and our mathematics, but oppose the ERA. For them, an unresolved tension exists between a conservative philosophy of life and the needs of the profession. It is nice to think of the cozy home, with the traditional roles of mother and father, as an ideal to be remembered and cherished. It is equally important not to sacrifice any benefits one might obtain in collaborating with a woman. Thus, on the practical level, these colleagues may respect us, admire us, and defend our right to be mathematicians. At the same time, their political and social philosophy may make them believe that "a woman's place is in the home." Let us hope that our younger colleagues, born after the advent of the women's liberation movement, will not have as much of a problem with this matter as their elders.

There are, of course, several other reasons for the rather paradoxical behavior of some of our colleagues. However, lack of time prevents me from discussing these even briefly.

Some professional women will not associate with any person who is opposed to the Equal Rights Amendment. They feel strongly that an affirmative position on the ERA is a minimum requirement which a colleague must satisfy if he is to accept women in his workaday world. I believe I understand and sympathize with their concern. Let us hope that the ERA will be passed in our lifetime. However, human nature is complicated. I can only say that — in the here and now — I personally have some good friends and colleagues who are opposed to the Equal Rights Amendment.

WOMEN IN MATHEMATICS: AN INTERNATIONAL PERSPECTIVE, EIGHT YEARS LATER

AWM panel held at the International Congress of Mathematicians, University of California, Berkeley, August 6, 1986. This is the one of the two panelist's reports missing from the September-October issue.

Bodil Branner, Denmark

In Denmark there are very few women with tenured positions in mathematics. I have not tried to find out what the percentage is, since one woman more or less would change the number significantly, but you get the right impression when I tell you that I am the only one in my department among 20 men.

Most of us — men as well as women — got our positions in the sixties and seventies. In the eighties there has been a cut-down at the universities causing a lack of new positions.

From this point of view I don't see much of a change during the last 8 years.

One thing which happened in our society during the sixties and seventies was that a huge number of women started to work outside their homes and got better educated. Parallel to that we had a rather strong Women's Liberation Movement. At the university level many new courses were started in literature, history, psychiatry and so on. Even a center for women research was formed, defined as research done by women, for women, about women. The movement therefore also carried a conservative traditional view about what women were supposed to do. A discussion about women in science did not exist in the seventies.

Right now the female students tend to dominate the universities. During the last few years the total number of female students entering the universities has been bigger than the total number of male students. But we don't see this pattern in science.

It is an amazing fact that the percentage of women who have finished their master's degrees in mathematics has been nearly constant since 1920. (I do not have the numbers for Ph.D.'s. It has only

been possible to get a Ph.D. in Denmark for about 15 years. We have another — higher — Danish doctor's degree.) In each decade since 1920 the percentage has been about 18%, with one exception. In the sixties the percentage increased to 25%. What happened during that decade was that it was possible to study only mathematics. Before and after you would have to study mathematics *and* another subject. Before the sixties that would always be physics. Now there are other possibilities. Unfortunately, it seems to have a negative effect each time the system forces girls to choose physics when they want to study mathematics. (The first serious drop-out of girls from the science program occurs in the high school, where — in Denmark — you have to choose physics at the highest level as well, if you want to study mathematics at the highest level. Recently there has been another possibility, namely to choose chemistry at the highest level instead of physics, and we see many girls doing that.)

For the last few years the percentage of female students entering mathematics has increased. It is the same as in the sixties or slightly higher. I have two guesses for why it is so: Now it is possible to combine mathematics and computer science, which gives a situation similar to the sixties, where it was possible to study mathematics alone. Contrary to the seventies, there now is a discussion in our society encouraging girls to choose “untraditionally”, because a traditional choice of education more often leads to unemployment and because the society needs more people in the “untraditional” jobs. The lack of engineers and computer scientists are mentioned very often. I hope the society is finally forced to change the expectation for how well girls will do in — among other things — science.

I don't see an open discrimination. I have certainly always felt welcome in the science community. But I see a lack of expectation for girls in science in the society as a whole, and it is hard to tell how serious an effect that causes. I also think that if we build our system of education too rigidly, then it will have a discriminating effect on women in general. What I mean is that if you — in order to have a career — have to do a lot of things at a particular age (which will often coincide with the time when many form a family), then we see a lot of women dropping out, more or less without a chance to get back in. In Denmark one rigidity of the system is that we have no bachelor's degree. So unless you finish with a master's degree, you have no degree at all.

GUIDE TO NONSEXIST LANGUAGE

Numerous reports have documented that when the generic word “man” is used to refer to both men and women, most people perceive it as referring to men only, rather than men *and* women. So what's a writer to do? Use “men and women” or “he/she” throughout a document?

The Project on the Status and Education of Women has published a *Guide to Nonsexist Language* which offers numerous ways to write clearly and fairly. The four-page *Guide* also contains a selected list of resources. Individual copies are available for \$2.00 (prepaid) from PSEW, Association of American Colleges, 1818 R Street, N.W., Washington, DC 20009. Bulk rates are available.

MISCONCEPTIONS AND EDUCATIONAL STRATEGIES IN SCIENCE AND MATHEMATICS

There is continuing research interest in “misconceptions” (or alternative conceptions, or alternative frameworks) held by students of science and mathematics. This seminar will review progress on research and teaching approaches that further clarify our understanding of learners' cognitive frameworks. Metacognitive strategies and other teaching approaches are gaining increasing importance in helping teachers to help learners take responsibility for their cognitive development, and papers or workshops on alternative educational strategies are invited. Interested science and mathematics educators are invited to this international seminar, which will be held at Cornell University, Department of Education, on July 26-29, 1987.

Topics to be considered include: underlying theories, sources of misconceptions, variations in specific subject matter, methods of research, testing: reliability and validity, consequences of

misconceptions, gender issues, alternative metacognitive strategies, strategies for teachers, empowering students to learn, social factors, role of computers and other technology, implications for teacher education, and philosophical issues.

For further information and application forms, write: Prof. Joseph D. Novak, Department of Education, College of Agriculture and Life Sciences, Roberts Hall, Cornell University, Ithaca, NY 14853.

GENDER, MATHEMATICS, AND SCIENCE

Beth Ruskai's letter about feminism and science in the May-June issue has generated more response than anything else that has ever appeared in the *Newsletter*. It has been reprinted in at least two other newsletters. Some of the response appears below. Further response will appear in the next issue. We hope the dialogue will continue.

LETTERS TO THE EDITOR

I want to respond to the letter from the editor and to Beth Ruskai's letter in the May-June 1986 issue of AWM's *Newsletter*. I no longer label myself as a mathematician, but I will mention my credentials since you seem to be concerned about how non-scientists are misinformed about women scientists. I received my Ph.D. from MIT in 1971. My dissertation was in 3-dimensional topology. I taught at Dartmouth College for five years after that before leaving. I was an assistant professor. This last year I have learned a lot about the social, historical, and cultural issues involved in the making and doing of science. I suggest that rather than have the focus be on feminist anti-science bias and other negative attitudes towards science and mathematics, that thoughtful scientists and mathematicians begin to study and understand that our way of doing mathematics and science is not free of bias. If one begins to see that, then perhaps one can then join with people like David Bohm, a Nobel prize-winning physicist and Evelyn Fox Keller (who regards herself as a scientist) in seeing the need for a multiplicity of voices. Neither are negative towards science. They are just calling for some understanding of the biases that do exist in math and science today, to see how they limit what we can know and understand. From there one perhaps can begin to expand and enrich these fields.

I was disturbed to read Beth Ruskai's remarks about Keller. Although not speaking to her directly, she intimates that Keller is propounding a feminization of science. I suggest that people read *Reflections on Gender and Science* thoroughly. One can then understand Keller's arguments that our way of doing science — that is, the dominant rhetoric and prevailing mode — is not gender-free. She is not asking for a feminization of science. Instead she asks that we look at our biases so that we may hopefully begin to transcend them. She argues for a science "in which difference, rather than division, constitutes the fundamental principle for ordering the world," where "respect for difference remains content with multiplicity as an end in itself."

Although I can see that some of the criticism of Turkle and Tobias is well-founded, I'd like to say that Beth is missing some points in suggesting that "proper" math preparation and stimulating programs to encourage the talented are the only ways to get at math anxiety or to encourage women to pursue scientific careers. We are being asked to understand that there is some gender bias in much of what is called science today, in our modes of teaching as well as the facts of science and the predominant way of doing it. Something more is being asked of us. Barbara McClintock (the subject of Keller's *A Feeling for the Organism*) is an example of someone who does not believe she is doing feminist science, but her style of doing biology is definitely not mainstream. Perhaps we can understand how it isn't and begin to offer science courses that reflect some of her style, for example. It is a style that I suspect might be more amenable to people who engage with their subject matter in a more personal manner.

Another book that I found helpful was Morris Berman's *The Reenchantment of the World*. Berman focuses on a change in the mode of consciousness that took place at the time of the scientific revolution — from a participatory mode to a non-participatory one. From a sense of relation with the object of study to a sense of separation from such objects. He is looking at the social, political, and economic factors that brought about this change. He doesn't get into gender issues at all. So for a start

I'd suggest people read these two books. Another important work for me was Bohm's *Wholeness and the Implicate Order*, a thoughtful, struggling work which looks at how we fragment science in particular and our entire world at large because of the splits and polarization in our thinking process.

So I am suggesting that instead of dividing into camps, feminists against science and women scientists against feminists and mystics, we begin to speak with each other. A thorough reading of the books I suggested might provide a good beginning. As a part-time faculty person with the Adult Degree Program of Vermont College, I have been presenting such material for the last several months and have begun work on some articles based on this work. I would be happy to come to share my ideas with any of you who are interested.

Sincerely, Marianne Nichols, 106 Lower Newton St., St. Albans, VT 05478

To the editor:

Mary Beth Ruskai's recent letter in the *AWM Newsletter* reminded me of an event long ago and far away, when I found myself, together with Judith Longyear, one of two mathematicians invited to a meeting of young women scientists in Washington, D.C. sponsored by NSF. Neither the criteria of selection nor the purpose of the meeting were ever quite clear — NSF used us for an informal study, and the meeting just happened to occur while Congress was considering a women in science bill — but it was supposed to be supportive and friendly. Most of the women were in the social sciences or medical research; very few were in the physical sciences. Longyear and I felt somewhat out of place there. Our perceptions seemed skewed to many of the consensual positions that were developing. The climax of the meeting was an address by Margaret Mead, and it became clear that something was seriously wrong.

Her thesis, as I remember it, was that women are raised by Mom and, identifying with womanhood, have no great developmental discontinuities, never need to scrutinize the world that hard, can remain subjective, whereas men, cast out into the mysterious world of maleness, realizing Mom as Other, are forced into objectivity. And this, dear friends and fellow scientists, causes women to be fabulous social scientists while men are fabulous physicists and mathematicians.

I was shocked by the speech, implying as it did that no woman could be Gauss, Euler or, for that matter, Noether. I was shocked by the warm applause. Questions submitted in writing were fielded by Mead. My question was simple — essentially the same as Ann Hibner Koblitz' abstract in the summer *Newsletter*. It went something like: but women *are* excellent physicists, chemists, mathematicians, how do you account for that? To my surprise she picked my question for an answer. To my embarrassment she asked me to identify myself and stand up (which she had done with no other questioner). Then, with all the psychological advantage this, added to her already imposing personal presence, gave her, she proceeded to skewer me, essentially telling me that I and my mathematician, physicist, chemist, etc., sisters were misguided, possibly psychologically warped. The end. Next question please.

No folks, the masses didn't swarm around me afterwards and commiserate on how the old girl had gone off the deep end. Nobody said a word. The empress may have no clothes, but if everybody wants to think she has — well, what are we to do?

I'm not really sure. Personally, I've decided to start paying attention to the junk that's being published on women and science, even forcing myself to read some of it. It truly can be amazing stuff. We have the bad use of biology and statistics — hormones, left-brain/right-brain oversimplifications, SAT scores, Y-chromosome hypotheses, even, God help us, sociobiology.

And on the left — ah, it is there we are truly betrayed. The radical stance seems to be: let us salute all those brave women who fought through male hierarchies to study science and mathematics, their hearts' desires, and, for the rest of this essay, we will show that they were terribly misguided because science is so, ugh, MALE, so tainted with chauvinism, let's topple the structure and make it over in a female image.

I can't help reading that as: I don't like math and science so you shouldn't either. Yet this attitude cannot be ignored, being triply dangerous: in denying women scientists their rightful role in the feminist community; in encouraging, for yet another reason, young women to avoid science and mathematics; and in supporting male vs. female rhetoric.

However, there are exceptions. Not being a social scientist, historian, or philosopher, I find things hit or miss, but can warmly recommend anything by Hilary Lips (who does not, as far as I know, write specifically about women in science or mathematics, but does a great job in generally skewering gender stereotypes). And also, *pace* Ann Hibner Koblitz, I like Evelyn Fox Keller. I read Keller differently than Koblitz does, and consider her worthy of defense. The following comments are based on her collection *Reflections on Gender and Science*.

Keller does not ask why women don't do science, nor even why science is perceived as masculine, but rather: how does the perception of science as masculine affect both our perceptions of science and of gender? Implicit in this question are two hypotheses: science need not be perceived as masculine, and gender stereotypes are damaging to the intellectual, emotional, and social health of the individual. Much of the book traces gender metaphors in the development of science — her chapter on Plato and Athenian pederastic images struck a classicist colleague as first-rate. These metaphors change with time. They are not universal truths. They can only change from within science. They are often ignored in the practice of science (is your normal run-of-the-mill particle physicist trying to *conquer* quarks, according to the Baconian metaphor which still rules the popular image of science, or just trying to figure them out?). But they affect who goes into science and how it is justified (think of Senator Proxmire) and sometimes tip the balance in scientific values. We do not need a revolution from outside. Science is not rotten to the core — after all, it works. But it could be more open to understanding its own use of metaphor, and perhaps extend the metaphors presented to include more points of view.

Just as metaphors about science are not universal truths, neither are stereotypes about gender. Here Keller goes deeply into what is called object relations theory, which is the theory that Mead so gravely abused to those many years ago. Object relations theory is the study of how the infant and small child begin to understand the concept of other, of subject versus object. Boys are supposed to be this way, girls are supposed to be that way but, hey, they're not. The reality is a lot more interesting than that. Keller seems to be inclusionist, rather than exclusionist, working toward a gender-free concept of science and, in fact, a gender-free concept of gender (or, as *Ms.* magazine puts it, "free to be you and me").

Let's examine three quotes Koblitz uses in her discussion of Keller's work. The first quote from Keller states that the Baconian image of science added to the polarization between male and female, making reason male and feeling female. But this is not the same as saying that 17th century science did this — calculus is true, lacks political content, and is not inherently masculine. But the images in which science was presented — yes, these do support a certain ideology and come out of a certain time and place. If calculus is perceived as masculine, this will have consequences, ones that I doubt Keller or any reader of this newsletter support.

The second quote from Keller says that inauthenticity is the cost a woman suffers by identifying with an image of the scientist modeled on the patriarchal husband. Keller is not saying that inauthenticity is the cost a woman suffers by becoming a scientist. Nor is she saying that a good scientist must model her/himself on the image of a patriarchal husband. In fact, I read her as saying that the image of a patriarchal husband is a lousy model for a scientist of either sex. But, when that is the image that is presented, how is a woman to become a scientist in the first place? Where is she to get her self-image? I know my own progress as a mathematics student was marked by severe disjunctions of self-image, that it took me too long a time to internalize the lack of contradiction between "woman" and "mathematician," and that I even avoided math in college to avoid what my society deemed a contradiction. The outstanding women mathematicians of the previous generation it has been my privilege to know claim to a woman never to have been aware that mathematics was supposed to be masculine, just figured the other girls weren't interested, and thus were free to pursue their mathematical talent.

The third quote is from Leanna Standish, a woman I hope never to meet, who claims that science "embodies the quintessential values of patriarchal culture," i.e., science is the enemy. Here is the fatal mistake of confusing the metaphor and imagery of science for scientific content, a mistake that Keller is careful not to make. Keller repeatedly states that science works and embodies a real form of truth, and that scientists themselves do not follow the stereotypical images nor even the public philosophical justifications of science in their doing of science (she is somewhat of a Kuhnian).

Koblitz' general critique of feminist theories on gender and science is well taken, but I really do believe that Keller is exempt from much of this. If she is quoted widely, I suspect she is not understood, and that people who don't know beans about science are borrowing the cachet of a woman who, after all, started adult life as a mathematical biologist.

Here is a suggestion: why not send copies of the *AWM Newsletter* to women's studies departments? Why not get together with AWIS, SWE, etc., to have their newsletters sent to women studies departments? This is one way of becoming more visible to the feminist community, making it more difficult for them to raise theories which deny our existence and discourage young women with scientific and mathematical talent from following that talent where it leads them.

Sincerely, Judy Roitman, University of Kansas

Dear Dr. Ruskai:

I don't know how the other social scientists mentioned in your long and thoughtful letter to the *AWM Newsletter* readers will respond to your call for discussion, but I respond very positively.

While I think you may have misinterpreted the thrust of my *Physics Today* article — I was trying to say that I thought the math-anxiety reduction model was probably *not* going to work in curing physics avoidance — I think your points overall are well taken: If women scientists do not speak out on the issues of women in science, and why more women are not in science, then non-scientists will have the floor. (There is a saying in my own field of history that if we historians shy away from recent and/or controversial subjects, then the journalists will write about them instead. I think you are making the same point.)

I have been mindful since the beginning that by focusing on the *problems* many women have in confronting mathematics I might inadvertently be giving grist to the mill of those who wish to believe in biologically-based intellectual differences between the sexes. Lenore Blum, a founder of AWM, can attest to the fact that I had her dictate a paragraph that appeared in my first article on math anxiety in *Ms.* magazine in 1976 as to the numbers and quality of women mathematicians in America. My feminist nightmare was, and remains, that owing to my work some woman scientist or mathematician would have yet one more hurdle to conquer in pursuing her professional goals.

For this reason, more perhaps at the beginning than now, I tried always to differentiate two problems *in re* women and science or mathematics: 1) the need to attract the ablest young women to careers that she might otherwise avoid because of role stereotyping; 2) to add a math or science component to the general education of the typical female English/history major's experience at college. I have felt for about the past five years that Task No. 1 is moving forward quite well, Task No. 2 has a long way to go.

Perhaps I should make these distinctions in every article I write, and I am grateful that you reminded me of this. For if you could have misunderstood my fundamental assumptions, so may other readers not as sympathetic to women as are you and I.

As for the Fox-Keller and Gilligan theses. They would have us believe there is such a thing as "female" science (like "Jewish science" in Nazi ideology or "bourgeois science" for the Soviets) — not simply a distinctive (and universally female) *style* of approaching science, but actual differences in Truth. I couldn't agree with your position more on this issue. I see this as an inappropriate and *wrong* extrapolation from Gilligan's work in women's moral development to women's work in science and as very likely to be used against all of us, scientists and non-scientists alike. I don't think women are more intuitive than men or that science excludes intuition. I don't believe non-quantitative science exists in the present day, and to propose it as a "solution" for math anxiety is to pervert my intentions.

Thus, we are, I believe, quite close to one another and need to communicate, perhaps through these pages and with others, as to how to join forces against our real enemies: 1) The Stanleys and Benbows who tell the world every five years that there is a male math gene to account for sex differences in career choice and performance; and 2) the biased department chairs and peer reviewers who don't treat women scientists and mathematicians fairly.

For the record, stated unambiguously, here are my five commitments and beliefs:

- 1) There is no "male" or "female" science.
- 2) Men and women, on the average, are equally likely to be very able or moderately able in mathematics and science. Women who are not as able, however, are more likely than men to experience math *anxiety* which makes them appear still less able than they really are.

- 3) The remaining disproportion of men in math and science-based fields still today has to be countered by a vigorous attack on all unfounded assumptions and all institutional barriers.
- 4) Until that battle is won, women may need extra compensation, extra encouragement to compete with men.
- 5) Success at math and science presumes high ability, learned discipline, confidence and a positive self-image.

...

Sheila Tobias, Tucson, Arizona

Ruskai's comments (May-June issue) are very much to the point. I am constantly mystified by the number of women who conduct experiments that purport to show that women are inherently inferior in mathematics. I have myself been conducting a long-running experiment: for roughly 50 years I have been teaching college mathematics. I have yet to see any difference in the mathematical ability of men and women, except that, on the whole, the women are more capable. This slight difference I attribute to Society's constant pressure to keep women out of mathematics unless they are very determined. Indeed, the very best calculus class I have ever taught was an extremely well-prepared class of women. I can only attribute the sociologists' activities in this direction to their having bad cases of "mathematics anxiety," which consists not just of inability to do mathematics, but of worrying about this incapacity.

Now lots of people are incapable in some area or other. I, for example, have neither musical nor athletic talent, but I don't worry about it. I don't have music anxiety or football anxiety. I would like to be able to sing, but it doesn't bother me that I can't. When I meet a professional singer at a party, I don't make silly remarks like "Oh, I never could sing a note." Why are people so defensive about their mathematical deficiencies?

I suspect that the reason is that mathematics is perceived as being important to Society in a sense in which music and athletics are not. Mathematics and English are the two subjects that are taught all through school. There are reasons for this emphasis: English is needed so that we can communicate with each other; mathematics, so that in the first place we can cope with the arithmetical demands of daily life; and second, because without it, Society would have little science and still less the technology that we love so much.

It is socially acceptable to be incapable in an activity that is not felt to be important in everyday life. People who are incompetent in mathematics feel defensive — that's presumably why they make inane remarks when they meet mathematicians. They go out of their way to show that they can't be blamed because they, as a class, lack talent. If you lack a talent, it is comforting to believe that you belong to a class that is generically incompetent. If you are a woman, the class of women is the most obvious class, especially since there really are fewer female than male mathematicians, for rather obvious social reasons. There are also fewer female than male dentists, but I don't think anyone has tried to show that women as a class lack ability for dentistry.

Ralph P. Boas, Northwestern University

Dear members:

In response to Mary Beth Ruskai's letter on "Feminism and Women in Science" in the May-June 1986 issue, I would like to comment in particular on the topic of computer programming style of girls and boys as discussed by Sherry Turkle in *The Second Self: Computers and Human Spirit*, and referred to in this letter. I find the idea that girls prefer the interactive "soft" style, while boys prefer the planned "hard" style, both ridiculous and offensive, and annoying as well, for certainly with her credentials some people will believe what she says.

I have worked with computers for over sixteen years, initially as a programmer when I was learning how, progressing through a variety of positions, and now as a manager of a software engineering group for General Electric. I studied mathematics, now have a degree in computer science, and spent three years in the Ph.D. program at UC Berkeley, before giving up due to the combination of impossible pressures of family life and school. Due to financial necessity I was forced to figure out how to put my brain and education to use in some way and decided to learn how to program and use computers in the late '60s.

Now as manager of a group, consisting of three other women and eight men, which produces large software systems (50-100 routines) in a variety of programming languages for different computers, and having worked with many women over the years, I have information with which to counter Sherry Turkle's ideas. The women in my group, and most of the women I have worked with, are as good as or better than the men. They do "plan" their programs (this is known in the industry as software design), and they are creative (but so are the men) in solving critical software problems, such as the design of an elegant data structure or the solution of a timing problem. From what I have seen, there is no division of programming style between men and women in the manner which Turkle suggests. The people in my group have math, computer science or electrical engineering educations. The only differences I find among all the people in the group, but not between men and women, is in the emphasis, some having better analytical skills, others preferring hardware problems, while others prefer the strictly software issues.

If by "interactive" programming Turkle is referring to programs that query the user for inputs, then this is done if required by the system of software by either men or women. Somehow I don't think that was what was meant, and guess that Turkle's definition of "interactive" programming style means to think it up and type it in as you go along. If that is what she meant, then everyone does that occasionally, to get something done quickly, or to develop a prototype, or just to try out some new feature. This is not relegated only to women. Men do it too. In fact everyone should be able to do it, if they have worked in software long enough. It implies a certain level of skill and fluency that people are proud to possess. However, all programs developed on a contract basis are "planned" or they would never get developed. All software must pass through several design reviews, and its "plan" must be good to get through. Everyone does this, both men and women.

On the subject of "intuitiveness" of women (considered to be the opposite of "logical" by Turkle), although this is so vague as to be hard to discuss, I disagree that women have this capability more than men. What is needed in good software design is the ability to imagine things in the large, before all the details are known, and to build a structure that accomplishes it. This might be compared with writing music or painting in that an overall concept must exist in the mind before one can start. This is an individual talent. Some people have it, others don't, but in software design I have never found it to be sex-related. Finally, to kill the subject of intuitiveness as a domain only of women, it should be noted that most managers are still men, and since managing does require "people skills" such as understanding what is being said nonverbally when the words don't come across, or in making assignments that fit people's inclinations, or in evaluating performance, or in interviewing, men must possess some of these qualities by virtue of their numbers. Of course they don't all have intuitiveness, but neither do all women.

The main difference I see between men and women is in the numbers of them. There are always fewer women to interview. This has to do with early educational choices and no doubt with some people believing the kind of thing that Turkle proposes and influencing girls to study non-scientific, non-mathematical subjects. I am interested in doing whatever can be done to keep girls in mathematics and using computers. This is the way to develop their talents, which they have as much as boys. It's just that the boys are encouraged and have more opportunities, and no social pressure working against them to study science or math.

Sincerely, Ann Marsh Robinson, Palo Alto, CA

In response to Mary Beth Ruskai's letter on "Feminism and Women in Science" (*AWM Newsletter*, May-June 1986), I would like to distinguish in the feminist critique of "science" the views that come from the "outside" (social scientists, educationists, and women of letters) and those from the "inside" (people who have had some experience with "science"). I am assuming that "science" in these discussions includes the natural and mathematical sciences.

Of course we need to communicate to laymen (some of them are our "users" and many have access to elementary and high school teachers and students) what our discipline is about — for example, one learns by doing. The AWM taking an active role in participating in the discussions is a good start. Also, some of us who teach non-science students in what we call "service courses" have an important and often unrewarding job of doing more than not perpetuating the stereotypes of science. Most of these students do not see it as their responsibility to seek an "understanding of the diversity of scientific workstyles and personalities," to use Ann Hibner Koblitz' words (*AWM Newsletter*, July-August, 1986). As Beth Ruskai has suggested, one may interact with non-scientists on a university-wide committee. One has to be prepared that sometimes by pointing out misconceptions, one may be viewed as defensive, functioning by male-models, unenlightened, or downright hostile, which may immediately bring one's effectiveness to question. It would be extremely nice to have some support from one's own professional organization, if possible. Query: Can we agree on what the misconceptions are?

More importantly, I do hear a desperate appeal in the voice of discontent and general malaise from some feminists who have not learned much science and feel alienated. "If only physics had been presented to me as in the *Tao of Physics...*," a Ph.D. in English said to me at a conference on "Women in the Curriculum" (it may be significant that I have to cite an example in physics instead of one in mathematics). I, for one, am not willing to say that if more women do mathematics, they would not bring about a "change" in some of the practices from within.

While we may not agree on whether science is "gender-neutral," perhaps we can all recall experiences which indicate that the practice of science is not "gender-neutral." To the extent that our judgments and values are shaped by our experiences, the practice of science, I believe, is not "neutral," gender or otherwise, since judgment is exercised in its practice. It seems to me, though, at times factors other than gender become an overriding influence in our judgment. If gender plays such an exclusive role as some have claimed, would many of us have become mathematicians? Do male scientists sometimes adopt female-models?

In clarifying some of our own assumptions and engaging in a dialogue with these feminist critics, women in science and mathematics may even attract some women and girls into the field and make an impact in their own field.

I notice the absence of debate on the structural barrier to more women gaining a place in science. Have we arrived at what is being called the post-feminist era in Boston?

Sincerely yours, Pao-sheng Hsu, Columbia Falls, Maine

FROM THE PRESS

from *American Health*, June '86, Working Women, "What's Happened to the Class of '75?" by Eileen Garred thanks to Cathy Kessel for bringing this to our attention

Women who blazed the trail into boardrooms and research labs may not recognize the younger sisters who've followed them. That conclusion comes from psychologist Lora Heims Tessman from the Massachusetts Institute of Technology. Tessman has studied female MIT grads to spot the differences between the classes of '65 and '75. She's found that later graduates have a more balanced psychological makeup. Reason: The culture had changed — and more of these women grew up with working moms.

When Tessman reviewed the history of the 26 grads of 1965 she found only 4% had mothers who worked as professionals. The students tended to identify with their fathers more than their mothers

At MIT these women tried hard to fit into a man's world, and had difficulties combining their personal aspirations with their image of being a "woman," says Tessman. Most of the '65 students majored in math and hard sciences — physics, chemistry, biology.

By age 40 many of these women were shifting to more humanistic, "real world" pursuits — replacing, say, pure research in physics with work on therapeutic uses of radiation. Tessman . . . thinks these women were finally letting their moms back in: "They seem to reintegrate values they had previously associated with their mothers into their own lives."

Tessman doesn't expect to see as many mid-life professional shifts in the '75 grads. From the beginning, a smaller percentage of them chose theoretical sciences. Most opted for engineering, computer science and business.

Tessman thinks these choices are connected to childhood: About 35% of the '75 grads had professional mothers. They seemed better able to mesh being "feminine" with their career choices, she says. From the beginning, they drew on mom's strengths as well as dad's.

...

Ms. magazine, July 1986, letter to the editor:

I am writing to tell you that the Women's Movement has not been in vain. This year (my junior year) I was accepted by a prestigious college as a mathematics major. I fully intend to carry my mathematics studies to the greatest extent, and to receive a Ph.D. With this, I hope to become a professor and be a role model to other girls in math. All that I can say to those who contend that males are better than females in mathematics is that they sure as heck didn't test me!

excerpts from "Math = Hormones: Light shed on workings of the 13-year-old brain," editorial, *The Day*, New London, Ct, June 3, 1986

Why are boys better at math? It's the kind of question that keeps you awake nights, right? Let's say you're trying to count sheep. If you're a boy the counting apparently goes rather smoothly. Sheep is sheep. But if you're a girl, chances are — according to the statistics — you're not going to be as facile at keeping the baa-baa tally. Elaborate equations are out. Perhaps you get distracted. Think of tea parties and flower shows. Who knows?

You can't argue with facts. And now we have the facts about mathematical ability. Just as you always suspected, boys are better because they are boys.

...

Whatever the scientific validity of Dr. Benbow's study, her findings must come as a relief to the often perplexed custodians of the nation's junior high school males. Up until now, the hormones coursing through pubescent veins causing the little devils to commit all manner of mischief haven't been thought of in a terribly positive light. If these mysterious secretions are, in fact, good for something other than torturing frogs, sticking safety pins through ears and contorting the teen-age body into a permanent slouch, then let us all say hallelujah.

Hallelujah.

Letter to the Editor, "An injustice to all the women mathematicians," *The Day*, New London, CT, June 7, 1986

Your editorial, "Math/Hormones," was a great disappointment. Even in its attempts at humor — allusions to "snakes and snails..." and "tea parties and flower shows" — you filled it with clichés, and you reinforced long-standing and unjustified prejudices.

Since joining the Mathematics Department of Connecticut College 24 years ago, I have always worked with most able and distinguished women colleagues in my field. Moreover, women have been among the very best mathematics students (both before and after the college became co-educational in 1969). Here is one example: Early election to Phi Beta Kappa is a singular honor, given to only three percent of the senior class. In 1985, two women were among the three mathematics majors with this achievement; this year, one of our majors, again a woman, gained this distinction.

You say, "Figures don't lie," but statistics, like any facts, need interpretation and are subject to slanting. My experience here and at other institutions has been with excellent mathematics students, both male and female. On the other hand, I have had some — including numerous male beneficiaries of the hormones referred to in your editorial — who have had neither talent nor interest in mathematics.

Significant mathematics goes substantially beyond counting sheep! Talent for the abstract thought and analysis required for genuine mathematical activity is rare among both men and women. It requires and deserves encouragement and nurturing.

Women are ill-served when told by teachers, parents, peers, and now even by the press, that mathematical activity is not suitable for them, or — and this is worse — that they are somehow biologically unfit for this undertaking, for nothing could be further from the truth.

It is most unfortunate, indeed, that *The Day* is party to the perpetuation of an unhelpful and unacceptable myth.

Ernest C. Schlesinger, New London
The writer is professor and acting chairperson.

cartoon, *Science*, Aug. 29, 1986

thanks to Catherine Folio, Brookdale Community College, for sending it in

panel 1: man with complex mathematical formula in thought balloon

panel 2: woman sucks up the thought balloon with vacuum cleaner

panel 3: man yells at woman

Folio suggests an "equal-time" cartoon: a thinking woman with an appropriately complex mathematical formula in the thought balloon, and a small child behind her chair with a very sharp pin.

MISINTERPRETED RESEARCH FINDING MAY HAVE ILL EFFECTS ON U.S. EDUCATION AND SOCIAL POLICY:

Testosterone-Math Ability Link Is a Weak and Esoteric Basis To Predict Giftedness in Boys And Girls

press release

"The recent headline-making study linking high fetal testosterone levels with later mathematical abilities should not be used to dictate educational and social policies because the conclusions are esoteric, tenuous and apply to at most an incredibly small percentage of the population," says Dr. Heather Johnston Nicholson, Director of Girls Clubs of America's National Resource Center.

The facts explained beneath the bold headlines linking high testosterone levels — e.g., boys and men — with giftedness in mathematics actually bring two important points to mind, she says. "The first is that the work of Harvard neurologist Norman Geschwind — which links excess testosterone levels in the womb with various kinds of abnormalities, giftedness, left-handedness and being allergy prone — accounts for *at most* the upper and lower few percent of boys in math learning. The second is that the report of Camilla Benbow and Julian Stanley to a recent meeting of the American Association for the Advancement of Science citing Geschwind's research to support their previous findings (of higher levels of mathematical giftedness in boys) is at best a tenuous connection. Benbow and Stanley, unable to measure testosterone levels in the wombs of the mothers of those seventh graders tested for math giftedness, concluded their findings were consistent with Geschwind's based on the high incidence of left-handedness and allergies among boys who scored very high on the mathematics ability test they administered."

According to Dr. Nicholson, most recent research indicates that spatial reasoning, math ability and math performance are complex factors still poorly understood. Moreover, studies by Entwisle and Baker ("Gender and Young Children's Expectations for Performance in Arithmetic") show that girls and boys perform about equally in mathematics through elementary school, as measured by both standardized tests and in grades. "Given the continuing socialization of girls that leads them to believe that girls aren't supposed to be good at numbers, that there's somehow something unfeminine about being able to do the quadratic equation, it's both premature and extremely unfair to attribute mathematical abilities to gender differences when our society is still inequitable to girls," notes Dr. Nicholson. "Even if it were true — and we don't know it is — that *some* boys are more likely to be extremely gifted in math than most girls, the average girl is liable to be as mathematically talented as the average boy. Yet, due to the myth of the 'math gene' and other factors, we are still a very long way from encouraging and supporting girls to do their 'personal best' in mathematical, scientific and technical courses. The critical issue is that girls have been consistently and systematically steered away from participation in math and science, and research of the Benbow variety becomes an excuse for doing nothing about the glaring inequities in our educational and social system."

Girls Clubs of America, a national, not-for-profit organization serving 250,000 girls across the United States through 240 Girls Club centers and various outreach programs, is taking forceful and effective action to address these issues and inequities. GCA established Operation SMART to encourage girls to overcome traditional barriers and pursue math and science. Supported by major grants from the National Science Foundation, the United States Department of Education, and the General Electric Foundation, among others, Operation SMART challenges girls to engage in scientific inquiry: to generate questions, define a problem, explore, experiment, observe, document, dissect, analyze, test alternatives, draw conclusions, and start all over again with new questions. Girls learn to take chances, guess, and predict, that mistakes are productive. They learn that it's all right to propose an incorrect theory, that it's okay to get their hands dirty while taking apart equipment to see how it works, and dozens of other direct and indirect lessons that help them recognize and develop their

scientific interest and mathematical skills. Operation SMART helps girls apply this systematic approach to their daily lives, and to view math and science as appropriate arenas in which to excel.

Operation SMART is collaborating with the American Association for the Advancement of Science, the Association of Science-Technology Centers (the umbrella organization for the nation's science museums), EQUALS (nationally recognized developers of math curricula based at the University of California, Lawrence Hall of Science), and the Children's Television Workshop. Girls Clubs of America's National Resource Center, whose Center Associates include the major researchers on girls in math and science, will convene the leading experts in this field in October 1986, with funding from the Ford Foundation, to discuss the latest findings and propose appropriate responses.

REVIEW of Pelageya Kochina, *Love and Mathematics: Sofya Kovalevskaya* (Moscow: Mir, 1985) — in hardcover, with illustrations, appendices, and bibliography. [Translation of P. Ya. Kochina, *Sof'ya Vasil'evna Kovalevskaya 1850-1891* (Moscow: Nauka, 1981).]

by Ann Hibner Koblitz, Wellesley College

Readers of the *Newsletter* need no introduction to the name and accomplishments of Sofya Kovalevskaya.¹ In the last ten years there has been an explosion of interest in her life and mathematics, and a large number of works on her have appeared in America.² The most recent addition to the English-language Kovalevskaya corpus is the translation of Soviet mathematician and academician Pelageya Kochina's excellent 1981 biography. For those who could not read Kochina's work in the original Russian, I highly recommend this translation. In fact, even for those who read the original, this book is of interest. Reorganization of the latter chapters, a small amount of additional material, better quality paper and illustrations, plus a readable translation *far* superior to those usually produced by Mir Publishers — all combine to make a Russian speaker happy to have the translation as well as the original on her bookshelf.

Kochina has been working on Kovalevskaya for thirty years, and has produced several biographies, articles, and collections of letters relating to Kovalevskaya's life.³ Despite the misleading and unfortunate choice of English title (for which I suspect Kochina is not responsible), *Love and Mathematics* is the most wide-ranging and complete of Kochina's works. It contains long quotations from letters and a wealth of detail not found in any other single source, as well as an appendix with extensive citations from Kovalevskaya's daughter's unpublished memoirs. The book makes enjoyable and informative reading even for those who have read just about everything about Kovalevskaya; for those with less knowledge, the book should be utterly fascinating and engaging.

Of particular interest for AWM members is Kochina's detailed exposition of Kovalevskaya's rotation work (pp. 291-309). Not only does she explain the rotation papers cogently, she also goes through A. A. Markov's criticisms of the work and shows where he exaggerated a small gap in Kovalevskaya's reasoning, and where he downright misinterpreted her results (pp. 300-304). Markov's objections appear to have been the chief reason for Felix Klein's veiled remarks on Kovalevskaya's Prix Bordin memoir in his history of 19th century mathematics. Kochina's discussion is therefore an especially valuable contribution to recent debates over Kovalevskaya's place in the history of her field.

A few words on Michael Burov's translation: overall, it is excellent. Through there are a couple of careless minor mistakes (Linne instead of Linneus, Gilbert instead of Hilbert), there is only one place where the meaning is confused.⁴ In fact, this is perhaps the best translation I have seen in the Mir series.

Unfortunately, Mir books are difficult to obtain in the U.S., though they are very reasonably priced. Moreover, *Love and Mathematics* was published in an edition of only 2550 copies — the original Russian sold out an edition of 117,000! — and I doubt many U.S. college bookstores will stock it. But, if possible, try to get hold of this book and recommend it to your libraries. It is well worth the effort.

[Ed. note: recently, the book has become available in the U.S. Order from: Imported Publications, Inc., 320 West Ohio Street, Chicago, IL 60610. The price is \$7.95 plus \$1.00 shipping. Canadian residents may order the book for \$6.95 from Bookworld, 237 College St., Toronto, Ontario M5T 1R4.]

Notes

1. For reasons of clarity I will adopt here the transliteration system used by Kochina's translator, though I myself prefer the library of Congress version.
2. See, for example: the translation by Beatrice Stillman of Sofya Kovalevskaya, *A Russian Childhood* (New York: Springer, 1978); Karen D. Rappaport, "S. Kovalevsky: A Mathematical Lesson," *American Mathematical Monthly*, vol. 88 (1981); Don H. Kennedy, *Little Sparrow* (Athens, Ohio: Ohio University Press, 1983); Ann Hibner Koblitz, *A Convergence of Lives* (Boston: Birkhauser, 1983); Koblitz, "Sofia Kovalevskaja and the Mathematical Community," *The Mathematical Intelligencer*, vol. 6 (1984); Koblitz, "Career and Home Life in the 1880s: A Mathematician's Choices," to appear in a collection edited by Pnina Abir-Am and Dorinda Outram, published by Rutgers University Press; Roger Cooke, *The Mathematics of Sonya Kovalevskaya* (New York: Springer, 1984).
3. Her most recent contribution is a translation into Russian (from French and Swedish) of the extant correspondence between Mittag-Leffler and Kovalevskaya; it would be wonderful to have these published in English.
4. Missing from Kovalevskaya's daughters memoirs on p. 320 is the transitional sentence contrasting Yulya Lermontova's way of relating to the little girl with Kovalevskaya's. This could be corrected by replacing the first "she" by "Kovalevskaya" in the sentence beginning with "Obviously."

REVIEW of "Sofja Kovalevskaja — ‚Prinzessin der Naturwissenschaften‘: Ein Betrag zur Enthoerisierung," *Feministische Studien*, vol. 4, no. 1 (1985), pp. 87-106

by Renate McLaughlin, University of Michigan-Flint

In the May-June 1986 *Newsletter* Anne Leggett mentioned that she had an article about Sofia Kovalevskaja from *Feministische Studien* and asked for a volunteer to review the paper. The title sounded interesting, and I volunteered.

The article is a biography that emphasizes Kovalevskaja's relationship and contributions to the feminist movement (I don't think the facts of her life need to be repeated here). No attempt is made to assess her contributions to mathematics or the natural sciences — only footnotes #10 and #68 briefly mention her scientific work.

Stuby compares Kovalevskaja's biographies by Ann Hibner Koblitz and by Don H. Kennedy with the predictable result that Koblitz's book is considered to be the result of careful research, while Kennedy's book is considered to be partly sexist and to contain "trivial fantasies." Stuby says that Kennedy's biography has the redeeming feature of many direct quotations from Kovalevskaja's own writing. She labels Koblitz's perspective as intentionally subjective, feminine (*ausdrücklich subjektiv, weiblich*) and Kennedy's perspective as ostensibly objective, manly (*vorgeblich objektiv, männlich*).

The article does not show any bias against mathematics or the natural sciences, as is fashionable at times. On the contrary, Stuby considers the support that Sophie Germain received from Carl Friedrich Gauss and the support Sofia Kovalevskaja received from Karl Weierstrass a phenomenon typical of pure mathematics: competence can be established regardless of political or other views. In footnote #39 Stuby states that she considers the current tendency, which also exists within the feminist movement, to view the natural sciences as evil incarnate as a dangerous political strategy.

A recurring theme in Stuby's paper is the assertion that women who choose to work in the natural sciences have had to suppress their own emotional needs and that Kovalevskaja was among these women. (Assertions like these offend me. Who — male or female — is to tell me how I should feel?) In the short introduction, Stuby states that Kovalevskaja's image, as an exceptional woman who succeeded in a male-dominated area of science, is only a deceiving appearance created by male historians. I did not find a clear argument to support this point of view. But Stuby's counter-claim to Kovalevskaja's image of success seems to center on unmet emotional needs, and I do not find it particularly convincing.

On the whole, I do not think that this paper contributes much beyond Koblitz's biography.

AWM CAREER BROCHURE

Pat Kenschaft, Montclair State College, has edited a new version of the AWM career information brochure. We encourage you to copy the next four pages and distribute copies to young women and girls everywhere.

What About Salaries?

You won't be poor.

You probably won't become rich either, unless you use mathematics as a path to top management.

Teaching salaries are low and usually are the same in any field. In 1985, however, the average annual starting salary in fields other than teaching for those receiving their first college degree in mathematics was in the mid-twenties, and for new Ph.D.'s was in the low forties.

Published by the
Association for Women in Mathematics
Box 178, Wellesley College
Wellesley, MA 02181

Membership in the AWM includes
a bi-monthly newsletter.

To join send a check to the above address.

Students memberships: \$5

Other new memberships: \$10

The AWM Speakers' Bureau lists women lecturers
available in all parts of the United States

brochure edited by
Pat Kenschaft

Copying of this brochure is encouraged.

CAREERS FOR WOMEN IN MATHEMATICS

Is Being a Mathematician Worth The Effort?

Most mathematicians like their work. It is flexible, highly creative, and has many possibilities for both solitude and intense teamwork. If you enjoy abstract thinking, or if you like solving problems and puzzles and figuring out things for yourself, then you should consider a career in mathematics.

Many mathematicians think
they are paid to have fun.

What Careers Are There in Mathematics?

There are many. For example:

- **PROBLEM-SOLVING USING COMPUTER TECHNOLOGY.** Mathematical training is necessary for many careers in computers. These begin by working with computer programs others have designed and continue by designing programs for teams to write. Such designs can involve either improving systems or such applications as the organization and retrieval of information for businesses, banks, government, and scientific endeavors.
- **TEACHING** at both the high school and college levels already has many openings, and the need is expected to soar between now and 2000 A.D.
- **ACTUARIAL WORK** in insurance companies, computing the costs and payouts of insurance that will provide competitive, profitable service
- **STATISTICAL ANALYSIS** for pharmaceutical companies (understanding which drugs are effective and safe with a minimum number of experiments) and environmental analysis (both for governments setting and enforcing standards and for companies complying with them)
- **OPERATIONS RESEARCH:** using mathematics to find an efficient way to distribute limited resources
- **MANAGEMENT:** A mathematics education opens the door for leadership positions in technical industries.
- **MATHEMATICAL RESEARCH:** formulating and solving mathematical problems. The field of mathematics is extremely alive; the amount of mathematics known to humankind has doubled each decade recently.

For further reading:

- WOMEN IN MATHEMATICS**, Lynn Osen, MIT Press, 1974
- MATH EQUALS**, Teri Perl, Addison-Wesley, 1978
- A CONVERGENCE OF LIVES. SOFIA KOVALEVSKAIA: SCIENTIST, WRITER, REVOLUTIONARY**, Ann Hibner Koblitz, Boston: Birkhauser, 1983
- PROFESSIONAL OPPORTUNITIES IN MATHEMATICS**, \$2 or \$1.50 each for ten or more, Mathematical Association of America, 1529 Eighteenth Street, N.W., Washington, DC 20036, 202-387-5200
- CAREERS IN APPLIED MATHEMATICS**, \$0.20, and also **PROFILES IN APPLIED MATHEMATICS** (about selected employers), \$0.30, Society for Industrial and Applied Mathematics, 1400 Architects Building, 117 South 17th Street, Philadelphia, PA 19103, 215-564-2929
- CAREERS IN STATISTICS** and also **STATISTICS AS A CAREER: WOMEN AT WORK**, both free for less than 25, American Statistical Association, 806 15th Street, N.W., Washington, DC 20005, 202-393-3253
- THE ACTUARIAL PROFESSION**, free, Casualty Actuarial Society, One Penn Plaza, 250 W. 34th Street, New York, NY 10119, 212-560-1018
- MATHEMATICS TEACHING AS A CAREER**, National Council of Teachers of Mathematics, 1201 16th Street, N.W., Washington, DC 20036, 202-620-9840
- WORKING WOMEN**, free, National Association of Trade and Technical Schools, 2251 Wisconsin Avenue, N.W., Washington, DC 20007, 202-333-1021

What Careers in Mathematics are Open to Women?

All. Women also become scientists, engineers, financial experts and computer scientists.

Could I have a Career in Mathematics?

Probably so, if you are reasonably good in mathematics, enjoy it, can work diligently, and have confidence in yourself. The United States has a great need for mathematicians, and jobs are plentiful.

MATHEMATICS REQUIRES TIME AND SELF-DISCIPLINE

What Must I Take in High School?

You should take algebra, geometry, and trigonometry, which are needed for traditional college calculus. Although many colleges provide remedial work in these subjects, it is easier if you learn them before beginning college. It is better to enter college on the second floor than in the basement.

How Much Mathematics is Needed After High School?

It depends on what you want to do. A college degree in mathematics (four years of full time study) requires about a dozen semester courses in mathematics. This provides entry into many professional careers.

A master's degree (two more years of math courses full time) is often helpful. Sometimes an employer will pay the tuition. A Ph.D. degree (another year of math courses and an original research project) is necessary for college teaching and useful for the most creative careers in mathematics.

How Many Women Are Now in Mathematics?

- About half of the college mathematics majors are women.
- About half of the members of the National Council of Teachers of Mathematics are women.
- More than a quarter of the new actuarial Fellows are women.
- About one-fifth of the Americans receiving doctorates in mathematics are women.

Is There a History of Women in Mathematics?

- Julia Robinson (1919-1985) was president of the American Mathematical Society from 1983 to 1985 and the first woman mathematician elected to the National Academy of Sciences.
- Emmy Noether (1882-1935) was the originator of modern algebra.
- Charlotte Scott (1858-1931) was one of the founders of the American Mathematical Society and was its vice president in 1905.
- Sonia Kovalevskaya (1850-1891) became the first woman to earn a Ph.D. in mathematics in 1876 and the first woman in modern times to hold a university position (at the University of Stockholm) in 1883.
- Hypatia (370-415) was professor of mathematics at the University of Alexandria and was called the "muse" of the ancient world.

What About Discrimination Against Women?

It exists. However, the worst forms of sexism have never been as common in technical careers and the most overt forms of discrimination have practically disappeared. Now discrimination takes more subtle forms:

- parents who don't provide daughters such things as blocks and construction toys or who discourage their independent thinking
- teachers who don't call on girls enough or don't encourage them as much as their ability merits
- guidance counselors who don't suggest a career in mathematics, or don't recommend taking as much high school math as one should
- peers who tease about curiosity and inhibit desires to do well
- an "old boy network" that provides contacts, which may be difficult for women to utilize
- people who don't take women's thoughts seriously because they are distracted by their beauty or what is perceived as their lack of beauty

Many experienced mathematicians believe that discrimination is more common in older fields, such as teaching, than in newer ones, such as applied mathematics and computer science.

What Should I Do About It?

Don't take it personally, and don't use it as an excuse for not trying hard. When you are young, work as if your success depended only on your own effort. When you fail — and we all do sometimes — remember that it may not be entirely your responsibility. There are many reasons, some beyond your control, why you may not achieve all your goals.

Constantly keep in mind that women can do mathematics. Learn about successful women in mathematics.

It is important to find friends of both sexes who support you and believe in you. They can reinforce your own belief in your ability to reason. Both peers and older friends (mentors) in your field (female as well as male) can help you make wise decisions, both political and technical.

Join with other people in similar situations. Keep in touch with women around you and join AWM.

If you suspect outright unfairness, remember that discriminatory behavior may be mere habit and the individuals involved may not intend to hurt you. Your mentors may be able to help.

On the rare occasions when discrimination is overt, legal action can be taken. The law is on our side.

Keep your sense of humor. Remember that health, sanity, and friendship are important too.

AAAS SYMPOSIA

Two symposia have been organized by AWIS (Association for Women in Science) members for the AAAS (American Association for the Advancement of Science) annual meeting in Chicago, February, 1987. They are entitled "The Participation of Women in Science Since Antiquity" and "Bias in Sex Differences Research."

GRANT-SEEKING

by Beverly Diamond, College of Charleston

The Institute of International Education, 809 United Nations Plaza, New York, NY 10017, (212) 883-8200, provides free of charge an excellent bibliography of publications describing sources of financial assistance called "Financial Resources for International Study." Many of the publications listed in this brochure are available in libraries; some contain further suggestions for grant-seeking. Of those listed in the above brochure, some standard sources are:

The Grants Register, St. Martin's Press.

Annual Register of Grant Support, Marquis Academic Media.

Directory of Research Grants, Onyx Press.

The Foundation Directory, The Foundation Center.

A Selected List of Fellowship Opportunities and Aids to Advanced Education, NSF. (Free)

The Directory of Financial Aids for Women, American Bibliographic Center—Clio Press.

JUNIOR YEAR AT DOUGLASS

fall 1986 update

The Junior Year at Douglass Program in Women's Studies is now entering its fourth year. Students from around the country come to Douglass for a year of intensive study about women's lives. Junior Year students take advantage of the many resources and courses available at Douglass, participate in invaluable internship and externship programs, develop a research project with one of the 70 scholars at Rutgers University who is currently working on Women's Studies related research, and learn how their Women's Studies background can help their future careers by participating in the career planning component of the program.

For a brochure about the program and an application packet, please write to the Director, Dr. Ellen F. Mappen, Voorhees Chapel, Douglass College, New Brunswick, NJ 08903, (201) 932-9197.

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 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. All institutions advertising below are Affirmative Action/Equal Opportunity employers.

University of Alabama. Dept of Math, Box 1416, Tuscaloosa, AL 35487-1416. (1) Three asst professorships (or higher rank for candidates with high qualifications) 8/16/87. PhD required by 8/16/87. Required: excellence in both teaching & research. Prefer those in applied math or topology, but will consider those in all areas. Applications invited both for tenure track & visiting positions. Women & minorities encouraged. Send curriculum vitae, reprints and/or preprints & at least 3 letters of recommendation to Search Committee at above address. (2) Four two year instructorships 8/16/87. Required: Master's Degree; salary around \$19,000. Positions not tenure track but renewable. Staff benefits for 2 year appointees include health, life & disability insurance & teacher retirement. Send curriculum vitae & have 3 letters of recommendation about teaching sent to Search Committee at above address.

Univ of Arizona. Dept of Math, Tucson, AZ 85721. (1) Tenure track positions at all levels. Required: PhD, excellent research record or potential, strong commitment to teaching. Field is less important than ability but should complement existing strengths in algebra, computational science, differential equations, dynamical systems, geometry, mathematical physics, nonlinear analysis, number theory, probability & statistics. (2) Several visiting positions for 87-88. (3) Several postdoctoral fellowships (Research Assoc.) 8/1987. Applicants in applied math, computational science and nonlinear optics may qualify for special Center of Excellence Awards. Only those with outstanding research records or potential should apply. Closing date: Feb. 1, 1987 or later if positions remain open. For all positions send application to Dept Head at above address.

CA State University, Fullerton. Dept of Math, Fullerton, CA 92634. Two tenure track positions at Asst or Assoc level. Required: PhD, outstanding teaching record & interest in continued research. Prefer those in math educ or statistics. Candidate must indicate interest in tenure track or lecturer positions or both. Rank & salary depend on experience & qualifications. By 2/2/87 send vita & 3 letters of reference to Chair of Selection Committee at above address.

CA State University, Long Beach. Dept of Math & Comp Sci, Long Beach, CA 90840. Dr. C. W. Austin, Chmn. Three tenure track positions in Math: (1) Numerical Analysis, (2) PDE emphasizing applications (preferred) or Operator Theory, (3) Algebra, Analysis or Topology with preference to specialty complementing present faculty interests. PhD in Math required. One tenure track position in Math Educ, with teaching interest in geometry, history of math or computer education; grant-writing experience required; PhD in Math Educ (or in Math with Educ experience) required. All positions require US citizenship or permanent residence, evidence of excellent teaching & strong research potential. Temporary appt as Lecturer possible. By 12/1/86 send resume, transcript & 3 reference letters.

Loyola University. Dept of Math, Los Angeles, CA 90045. Two asst professorships tenure track Fall, 1987. PhD required. May be 1 or 2 visiting positions. Will consider all areas of specialization, but prefer those in numerical analysis, applied math & math educ. Teach 9-12 hrs per semester. Teach wide variety of undergraduate courses. By 2/1/87 send cover letter (indicate if you plan to attend AMS/MAA annual meetings in San Antonio) resume & 3 letters of recommendation (1 on teaching) to S. Scarborough, Chair Hiring Comm

Mills College. Dept of Math & Computer Science, Oakland, CA 94613. Tenure track Asst, Assoc. or Full Professorship Fall, 1987. Required: demonstrated superior teaching & research abilities. Rank & salary dependent on experience & qualifications. 3 year contract. Send vita & direct 3 letters to Diane McEntyre, Math Search Committee.

Colorado College. Dept of Math, Colorado Springs, CO 80903. Tenure track position 9/1987 in Dept where research & teaching are valued. Required: PhD as well as strong ability & interest in undergraduate teaching. Desirable: ability to teach comp sci at levels above introductory level. Salary & rank depend on experience. Send vita & 3 letters of recommendation (2 concerning teaching ability) to Steven Janke, Math Dept. Will begin reviewing applications 1/5/87 & will continue until position is filled.

Trinity College. Dept of Math, Hartford, CT 06106. D. A. Robbins, Chmn. Tenure track asst professorship 1987-88. Required PhD in math & demonstrated excellence as a teacher. Prefer those with specialty in complex analysis, applied math, differential equations, numerical analysis, or comp sci. Teaching load: 5 courses per year. By 1/30/87 send curriculum vitae, academic record & 3 letters of reference to Chmn. Our representative will be at AMS meeting in Jan.

Yale Univ. Dept of Math, Box 2155, Yale Station, New Haven, CT 06520. R.R. Coifman, Chmn. 2 or 3 Gibbs Instructorships with outstanding promise in research. 2 year appt. 7/1/87. Light teaching load. By 1/15/87 send application & supporting materials. Offers will be made about 2/1/87. Salary \$28,000. Request application form from Gibbs Committee.

Occidental College. Dept of Math, Los Angeles, CA 90041. Nalsey Tinberg, Chair. Asst Professorship Fall, 1987. Required: PhD in Comp Sci or Math with expertise in comp sci. Two courses per quarter (8-9 hours). Salary \$26,500-\$30,000. Candidate expected to demonstrate excellence in teaching & research. By 2/10/87 send resume & 3 letters of reference (one about teaching) to Chair.

Univ of CA, Berkeley. Dept of Math, Berkeley, CA 94720. (1) Tenured Assoc of Full Professorship 7/1/87 in areas of algebra, analysis, applied math, foundations, or geometry & topology. Expect demonstrated leadership in research. By 1/15/87 send curriculum vitae, list of publications, a few selected reprints or preprints & names of 3 references to Marc A Rieffel, Vice Chair for Faculty Affairs at above address. (2) Tenure-track Asst Professorship 7/1/87 in areas of algebra, analysis, applied math, foundations or geometry & topology. Expect demonstrated outstanding research potential including contributions beyond the doctoral dissertation. By 1/15/87 send vitae, list of publications & a few selected reprints or preprints & have 3 people send letters of recommendation to Marc A Rieffel, Vice Chair for Faculty Affairs, at above address. (3) Several temporary postdoctoral positions Fall, 1987 for new & recent PhD's of any age in fields of algebra, analysis, applied math, foundations or geometry & topology. Applicants for NSF or other postdoctoral fellowships please apply. Prefer mathematicians whose res. interests are close to those of regular dept members. By 1/15/87 send resume, reprints, or preprints, and/or dissertation abstract. Have 3 letters of reference sent to Marc A Fieffel, Vice Chair for Faculty Affairs, at above address.

Univ of CA, Berkeley. Dept of Stat., Berkeley, CA 94720. Position at Asst, Assoc, or Full Prof. rank Fall 1987. Applicants should have strong research potential (Asst. Prof. candidates) or demonstrated res. ability (all other candidates) in any of the following areas: probability theory, applied probability. By 2/15/87 send applications, resume & names of 3 references to P. W. Millar, Personnel Committee, at above address.

Univ of CA, Santa Barbara. Dept of Math, Santa Barbara, CA 93106. Asst Professorship in stat/applied probability Fall, 1987. Required: PhD by time of appt & evidence of excellence in teaching & research. Highly qualified persons at tenure level are also encouraged to apply. By 11/21/86 submit resume & have 3 letters of reference sent to Joseph M. Gani, Stat & Applied Probability Program, at above address.

Univ of CA, Santa Barbara. Dept of Math, Santa Barbara, CA 93106. KY FAN Asst. Professorship - special 2 year nonrenewable position which carries a research stipend. Appt effective 7/1/87. PhD required by 9/1987. Selection based on res. achievement. Teaching experience desirable. Will teach 4 quarter courses per year. By 1/9/87 send vita & publication list & have 3 letters of reference sent to Faculty Search Committee at above address.

University of California, Los Angeles. Dept of Math, Los Angeles, CA 90024. Yiannis N. Moschovakis, Chair. (1) Four or five Asst Professorships in pure mathematics. Specific fields of interest: algebra/number theory, analysis, differential equations, geometry/topology, logic, probability & statistics. Required: strong research & teaching background. Will consider outstanding candidates at higher levels and/or in other fields. Teaching load: 5 quarter courses per year. (2) Three or four positions in applied & computational math at Asst Professor level (or higher). Prefer candidates in numerical analysis, mathematical modeling & scientific/engineering computing. Required: strong research & teaching background. Teach 5 quarter courses per year. (3) One or two Asst Professorships (or higher) in mathematical computer science. Prefer candidates in analysis of algorithms, coding theory, computational complexity, & theory of programming languages. Strong research & teaching required. 5 quarter courses per year. (4) Two E. R. Hedrick Asst Profs. Required: PhD during past 3 or 4 years (but may be of any age) & strong promise in research. No restrictions as to field; salary \$35,800. 3 year appt; research supplement of \$3,978 first summer. Teaching load: four quarter courses per year. Apply by 1/1/87. (5) May have a few adjunct asst professorships; 2 year appt; strong res. & teaching background; no restriction as to field. Salary \$30,000-\$32,000 for academic year. Teaching load: Five quarter courses per year. Also several positions for visitors & lecturers. For all positions write to Chair.

Florida State Univ. Dept of Math, Tallahassee, FL 32306-3027. Two tenure track asst professorships in pure or applied math. Desirable: strong research program & excellent teaching ability. Salary competitive. Send resume & have 3 letters of recommendation sent to Ralph McWilliams, Chmn, by 1/15/87.

Univ of Florida. Dept of Math, 201 Walker Hall, Gainesville, FL 32611. Six tenure track appts Fall, 1987, two of which will be senior appts. Senior candidates chosen by Dept will help select junior candidates. Dept interested in candidates in fields of differential geometry (including dynamical systems); mathematical algorithms & complexity theory; analysis & probability (particularly complex variables & stochastic differential equations). Candidates should have strong res. potential interest, interest in teaching & at least 2 years of postdoctoral experience. Rank & salary commensurate with experience & achievements. Send resume (& list of publications) & have 3 letters of reference sent to Gerard G. Emch, Chmn, by 1/15/87.

Georgia State Univ. Dept of Math & Comp Sci, Univ Plaza, Atlanta, GA 30303-3083. (1) Tenure track position 9/1987. Rank & salary commensurate with qualifications & experience. Qualifications: PhD in math with strong res. potential & commitment to teaching. Preference is for graph theory & matrix or linear algebra. Duties: teaching, research & service to support B.S. & M.S. degrees in math & comp sci. (2) Tenure track position 9/1987. Rank & salary commensurate with qualifications & experience. Qualifications: PhD with strong res potential in & commitment to teaching in comp sci. Prefer applicants in all areas of comp sci but especially in

Georgia State Univ (contd)

theoretical computer science, artificial intelligence, operation systems, software engineering, data communications, networking & analysis of algorithms. Duties: teaching, res & service to support BS & MS degrees in math & comp sci. By 1/30/87 send application, vita without birthdate but with citizenship status, 3 letters of reference & transcripts of all undergraduate work.

Univ of Hawaii. Dept of Math, Honolulu, HI 96822. Prof Ronald P Brown, Chmn. Possible positions in math, both visiting & tenure track. Rank open. Required: strong commitment to teaching & res. Salaries for full profs range up to \$4317 ; for asst profs from \$1894 to \$2804. Teaching load 6 hrs per semester. By 1/15/87 send curriculum vitae & have 3 references sent to Chmn.

Indiana Univ-Purdue Univ at Indianapolis. Dept of Math Science, 1125 E 38th St, P O Box 647, Indianapolis, IN 46223. Prof Bart Ng, Chmn. Two tenure track positions in pure & applied math 8/1987. Required: Doctorate & excellent res. record or potential. Prefer applicants in dynamical systems, numerical analysis, mathematical physics, classical & functional analysis, mathematical economics, index theory of elliptic operators, operator algebras, probability & applied stat. Teaching load 2 courses per semester. Excellent fringe benefits & competitive salary. By 1/15/87 send resume & 3 letters of recommendation to Chmn.

Purdue Univ. Dept of Math, W. Lafayette, IN 47907. M. S. Baouendi, Head. (1) Several regular or res. professorships 8/1987. Required: Exceptional res. promise & excellence in teaching. (2) Possibly one position at Assoc Professor/Professor level 8/1987. Excellent res. credentials required. For all positions send resume & 3 letters of recommendation.

Southern IL Univ, Carbondale. Dept of Math, Carbondale, IL 62901. Ronald Kirk, Chair. Asst/Assoc Professorship in Discrete Math 8/16/87. Required: PhD in math with strong background in discrete math. Candidates must have demonstrated excellence in res. or potential & evidence of teaching effectiveness. At Assoc. level record of published research is required. By 12/15/86 (or until positions are filled) send application, resume & 3 letters of recommendation to Discrete Math Position, c/o Chair.

University of IL, Chicago. Dept of Math, Stat & Computer Science, Box 4348, Chicago, IL 60680. Tenure track positions in algorithms, complex theory, numerical analysis, combinatorial & probabilistic analysis, & other areas of theoretical or mathematical computer science. Dept has active res. group in algorithms, complexity, combinatorics, coding theory & language design; also in many areas related to comp sci, including group theory, symbolic algebra, logic, queuing theory & matrix theory. Positions in other areas of math sciences may become available. Send vita & 3 letters of reference to Chmn, Search Committee.

Univ of IL, Urbana-Champaign. Dept of Math, 1409 W Green St, Urbana, IL 61801. (1) Sr. level appt in math 8/1987. Required: strong res. record in area of algebra compatible with interests of present faculty; these areas include, but are not limited to, representation theory of orders & integral representations of finite groups. Appointee expected to give leadership in supervision of research. Salary commensurate with experience. (2) Tenure track asst professorship 8/1987. Salary at least \$28,000. Candidates must present evidence of potential for excellence in both teaching & research. For both positions send vita with complete publication record & 3 letters of reference to Prof Heini Halberstam at above address by 12/1/86.

Univ of Iowa. Dept of Math, Iowa City, IA 52242. William A Kirk, Chair. Tenure track, tenured positions and visiting positions at all levels, 1987-88. Selections based on evidence of applicants' effective teaching & research achievements & potential; instructional needs of Dept; potential for interaction with faculty at res. level. Required: PhD or equivalent. Prefer those in partial differential equations, differential geometry & numerical analysis. Send vita & 3 letters of recommendation to Chair.

University of Kansas. Dept of Math, Lawrence, KS 66045-2142. C J Himmelburg, Chmn. (1) Instructorship Fall, 1987, normally renewable for 2nd & 3rd year. Salary to be determined. Res. interests should relate to those of current staff. PhD of dissertation accepted with only formalities to be completed. Send resume, dissertation abstract & have 3 letters of reference sent to Chmn. Deadline date: 12/1/86, then monthly until 8/1/87. (2) Tenure track & temporary positions at all levels 8/16/87. Prefer candidates in algebra & numerical analysis & areas meshing well with department's needs, but will consider others. Required: PhD or dissertation accepted with only formalities to be completed. Send resume, with description of research & 3 recommendation letters to Chmn. Deadline date: 12/1/86, then monthly until 8/1/87.

University of Louisville. Dept of Math, Louisville, KY 40292. (1) Chair. The Chair must provide leadership for growth, development, & renewal of the faculty & programs of the Dept during a time of change & expanding resources. Successful candidate must also be willing to devote considerable effort to the general administration of the Dept and to enhancement of its res. mission. PhD program is currently being explored. Candidates should have active research program, substantial scholarly achievement, teaching & administrative experience, and interest in undergraduate & graduate (Master's and PhD) program development. PhD in math is required. Research area compatible with department emphases and experience directing PhD theses is also preferred. Depending upon experience, appt will be at Assoc Prof or Prof level. Send letter of application with vitae & at least 3 letters of recommendation to Wiley Williams, Search Committee Chair by 1/16/87. (2) Tenure track entry level asst/professorship available for person with active research program in analysis, broadly interpreted. Candidates must have PhD in mathematical science by 8/1987; teaching experience in some form is strongly preferred. (3) Tenure track entry level Asst/Professorship available for a person with an active research program in discrete math, broadly interpreted. Candidates must have PhD in mathematical science by 8/1987; teaching experience in some form is strongly preferred. For positions 2 & 3 send letter of application with vitae, at least 3 letters of recommendation and an official transcript to Wiley Williams, Search Committee Chair, at above address by 1/1/87.

U. S. Naval Academy. Dept of Math, Annapolis, MD 21402-5002. Asst or Assoc Professorship commencing in Jan or Aug of 1987. Required: an earned PhD by date of appt, a commitment to excellence in teaching, and capability to pursue independent research, Specialization in applied math or operations research of particular interest. Send resume, transcripts and at least 3 letters of recommendation to Prof J. M. D'Archangelo at above address. Interviews conducted at annual AMS/MAA mta in San Antonio in Jan. 87.

University of Maryland. Dept of Math, College Park, MD 20742. Prof Nelson G. Markley, Chmn. Possible tenure or tenure track positions 8/1987. Rank & salary depend on qualifications. Joint appts with other units are possible. Exceptionally strong research program necessary. By 2/1/87 send vita, description of research & at least 3 letters of recommendation to Chmn.

Brandeis University. Dept of Math, Waltham, MA 02254. Alan Mayer, Hiring Comm. Chmn. Several faculty openings in pure math at visiting & asst prof levels 9/1987. Teaching load six hours per wk. Required: PhD & demonstrated excellence in teaching & res. Send curriculum vitae & letters of recommendation by 1/15/87.

Clark University. Dept of Math & Computer Science, Worcester, MA 01610. Tenure track position & one or possibly more visiting positions. Good teaching & strong res. credentials required for all positions. Preferred areas are automorphic forms, differential and algebraic geometry, representation theory, topos theory, and theoretical computer science, but applications from all areas of mathematical sciences are welcome. Send vita & 3 letters of recommendation to Margaret Comer, Search Committee, by 1/31/87.

MIT, Dept of Math, Cambridge, MA 02139. (1) A limited no. of applied mathematics instructorships for recent PhD's of any age. Appts will be made on basis of superior research potential for a period not exceeding two years. Final decisions will be announced on or before 3/1/87. Write to Committee on Applied Math, Room 20348, MIT. (2) C.L.E. Moore Instructorships in Math open to mathematicians with doctorates who show definite promise in research. Teaching loads six hours a week one semester, three hours a week the other. Appts are for one year, renewable for one additional year. Academic year salary will be at least \$27,200, Please send vita, a description of research in your thesis & the research which you plan for next year to: Pure Math Committee, Room 2-263, MIT. (3) Asst Professorships 1987-88. These appts will be for 3 years & teaching load will be six hours per week in one semester & 3 hrs per week in the other. Open to mathematicians with doctorates who show definite promise in research. Applicants please send (a) a vita; (b) description of your research; and (c) your research plans for next year to: Pure Mathematics Committee, Room 2-263 or Applied Mathematics Committee, Room 2-345, MIT.

Hope College. Math Dept, Holland, MI 49423. Tenure track position 8/1987. PhD in math required. Research & scholarly activity involving undergraduates is encouraged. Rank & salary depend on qualifications. Competitive salary and full benefit package offered. Forward vita, transcripts & have 3 recommendation letters sent to John R. Stoughton, Math Dept, by 1/1/87.

Michigan State Univ. Dept of Math, East Lansing, MI 48824. Prof Kyung Whan Kwun, Chmn. (1) Two postdoctoral fellowships in math (2 yr appt). Duties: teach one course per term & devote rest of time to research. These fellowships normally offered to persons (regardless of age) who have had doctorates less than 2 years. Some instructor positions available. Apply by 1/17/87. (2) Several tenured Asst/Assoc Professorships (maybe Full Professorship) 9/1/87. PhD in math, excellence in research (numerical analysis & other fields) & in teaching. For both positions send resume & have 3 letters of recommendation sent to Chmn by 12/22/86.

Univ of Minnesota, Duluth. Dept of Math & Stat, Duluth, MN 55812. Tenure track asst/assoc or tenured assoc starting 9/1987. Teach 2 courses per quarter including introductory & advanced stat & introductory math. Conduct active res. program. Contribute to planning & directing of stat components of applied undergraduate & masters program. Applied statistical experience & experience in undergraduate & graduate teaching & advising desired. PhD in stat, math or related field by 9/87. Further requirements for assoc. By 1/12/87 send resume, 3 letters, graduate transcripts to Ron Regal at above address.

St Olaf College. Dept of Math, Northfield, MN 55057. Paul D. Humke, Chair. Several asst professorships. One potentially tenure track. Remaining positions will be for 2 yrs. Required: commitment to excellence in teaching. Send resume, 3 letters of recommendation & statement of professional goals to Chair.

St Olaf College. Math/Paracollege, Northfield, MN 55057. C. Gengenbach, Chair. Tenure track position 8/1987 to teach 2/3 time in Paracollege and 1/3 time in Dept. Paracollege is a parallel track to the BA degree specializing in interdisciplinary seminars & individual tutorials. Interest in the history of mathematics and/or philosophy of science is desirable. Will hire at asst prof. level, but will consider those at higher levels. By early January, 1987 send 3 letters of recommendation, resume & a statement of professional goals & interests to Chair.

University of MO, Columbia. Dept of Math, Columbia, MO 65211. Three tenure track positions at all faculty levels. Required: PhD & distinguished research. Dept wants person in harmonic or probabilistic analysis at rank of assoc prof or above. Selections based on demonstrated res. achievement & quality teaching. By 1/15/87 send vita & 3 letters of recommendation to Keith Schrader at above address.

Dartmouth College. Dept of Math & Computer Science, Hanover, NH 03755. (1) 3 year tenure track position. Research in algebra (including algebraic geometry, algebraic number theory) of most interest, followed by combinatorics, probability & topology; applications welcome in all fields. Teaching: four ten-week courses spread over 2 or 3 quarters; may supervise graduate students. Send application, statement of res. activities & plans, graduate transcript, resume & 4 letter of recommendation to Recruiting Committee at above address. (2) John Wesley Young Research Instructorship, a 2 year postdoctoral appt for new or recent PhD's whose interests overlap those of a dept member. Teaching: 4 ten-week courses spread over 2 or 3 quarters. Nine-month salary: \$26,000; \$3000 summer research stipend. Send application, resume, graduate transcript, thesis abstract & 3 or preferably 4 letters of recommendation to Recruiting Committee at above address by 1/31/87.

Rutgers University. Campus at Newark, Dept of Math & Comp Sci, Smith Hall, Newark, NJ 07102. Jane Gilman, Chair. (1) Full Professorship 7/87. Required: strong research accomplishments. Teaching load & salary negotiable. (2) Several tenure track asst & assoc professorships 7/1987. Required: strong res. accomplishments or potential. Teaching load & salary negotiable. For all positions send curriculum vitae & have 3 references sent to Chair.

New Mexico State Univ. Dept of Math Sciences, Las Cruces, NM 88003. Carol L Walker, Head. Visiting positions & possible tenure track asst professorships in pure & applied mathematics, numerical analysis, statistics & computer vision 8/24/87. Salary competitive. PhD (or equivalent) & strong commitment to teaching & research essential. Send vita & have 3 reference letters sent to Head.

Bard College. Dept of Math, Box 91, Annandale-on-Hudson, NY 12504. Seeking candidates with strong interest in building innovative math program. Required: PhD by Fall, 1987 & commitment to teaching. Salary & rank depend on experience. By 1/15/87 send resume, statement of teaching & research Interests & 3 letters of recommendation (at least one concerning teaching) to Prof. Ethan Bloch, Math Search Committee.

Colgate University. Dept of Math, Hamilton NY 13346. Dan Saracino, Chmn. Tenure track asst professorship. All fields of specialization welcome. Research interests of current dept include commutative ring theory, low-dimensional topology, combinatorics, statistics & model-theoretic algebra. By 1/15/87 send vita & 3 letters of recommendation to Chmn.

Cornell University. Biometrics Unit, College of Agriculture & Life Sciences, 337 Warren Hall, Ithaca, NY 14853. Asst Professorship 7/1987. Duties: teaching in academic environment which offers BS, MS & PhD degrees in both Stat & Biometry. Required: PhD in Stat or Biometry. Prefer candidates with biological background & interest in statistical design or biometric applications. By 1/15/87 send resume, transcripts & 3 letters of recommendation to Prof. George Casella at above address.

University of Rochester. Math Dept, Rochester, NY 14627. Tenure track asst professorship or higher 9/1987. Required: significant res. accomplishments or exceptional res. promise & evidence of good teaching. No restriction as to field. Send curriculum vitae, summary of res. plans, reprints or preprints & have 3 reference letters sent to Chmn.

SUNY - Buffalo. Dept of Math, 106 Diefendorf Hall, Buffalo, NY 14214. Dr. Jonathan Bell, Search Committee Chmn. At least one tenured or tenure track appt 9/1/87. Salary competitive. Will consider applicants in all fields. Required: excellent research accomplishments/potential & strong commitment to teaching. By 12/1/86 send vita & have 4 letters of recommendation sent to Dr. Bell at above address.

SUNY - Buffalo. Dept of Computer Science, 226 Bell Hall, Buffalo, NY 14260. Asst professorship Fall, 1987. Required: PhD in Comp Sci or related field & superior res. ability. Departmental computing facilities include a VAX 11/780, two VAX-11/750s, six SUNs, six lisp machines & several image processing/graphics systems. Present res. areas include artificial intelligence, computer vision, numerical analysis, parallel algorithms, theory of computation, VLSI, etc. Salaries are extremely competitive. Send resumes & names of 4 references to Prof. Sargur N. Srihari, Chmn Search Committee, at above address.

POM and OR at SUNY Stony Brook. The W Averell Harriman College of Management and Policy and the Dept of Applied Math & Stat, SUNY at Stony Brook plan to appoint jointly a tenure track faculty member Fall 1987. Prefer candidates whose interests include some aspect of stochastic models in operations research. Teaching capabilities should include production & operations management. Harriman College offers grad programs in management of public, nonprofit, & business enterprises. The Dept of Applied Math & Stat has tracks in operations research, applied math and statistics. By 1/20/87 send a detailed resume, names & addresses of three references and copies of written research to Prof. M. J. Sobel, SUNY at Stony Brook, NY 11794-3775.

Syracuse University. Dept of Math, Syracuse, NY 13244-1150. L. J. Lardy, Chmn. Several asst or assoc professorships. Required: excellence in teaching & research. Prefer candidates in res. areas currently represented in Dept. One position in numerical analysis at rank of asst prof. For others preference will be given to those in areas related to nonlinear pde's, algebra, or discrete mathematics. Send curriculum vitae & have 3 letters of reference (and transcript if recent PhD) sent to Chmn.

University of North Carolina, Chapel Hill. Dept of Math, Chapel Hill, NC 27514. Tenure track faculty appt Fall 1987 for applicants with PhD & strong res. program in Ergodic Theory, Dynamical Systems. Exceptionally strong candidates in other fields may be considered. By 12/15/86 send application, vitae, abstract of current research & 4 letters of reference to Chmn, Math Dept.

University of Cincinnati. Dept of Math Sciences, Mail Location #25, Cincinnati, OH 45221. C. W. Groetsch, Head. Several asst professorships. Some possible visiting positions. For 2 of the tenure track positions we prefer applicants in numerical analysis & applied math. Other candidates with outstanding potential for res, scholarship & teaching will be considered. Send vitae & 3 reference letters to Head.

Kent State University. Dept of Math Sciences, Kent, OH 44242. Olaf P Stackelberg, Chmn. Tenure track asst or assoc professorship in numerical analysis and computational math 9/1987. PhD in numerical analysis or closely related field required by starting date. Salary competitive & negotiable. The Dept operates a computer laboratory with a VAX 11/780 (on CSNET), and a VAX 11/750, both under UNIX; a STARAN-E 512 processors parallel SIMD computer; four fully configured HP Labs AI 9000/300 workstations with the latest software; a Tektronix 4404 advanced AI workstation; laser printers; and other micro computers & peripheral equipment. Univ facilities include an IBM 3081D (on BITNET); a cluster of two VAX 11/780s under VMS; a Honeywell DPS 66; and other equipment.) By 3/2/87 send resume & have 3 letters of recommendation sent to Chmn. If position is not filled by 3/2/87, the deadline will be extended to 8/17/87.

Oregon State Univ. Dept of Math, Corvallis, OR 97331. (1) Possible assoc professorship in applied math, numerical analysis, 9/1987. Salary negotiable depending on qualifications. Closing date 1/15/87. (2) Possible asst professorship in applied math, numerical analysis, geometry or probability 9/1987. Salary negotiable, depending on qualifications. Closing date: 1/15/87. (3) Visiting appts 1987-88. PhD or equivalent training & experience. All ranks considered. Prefer applicants who augment research areas in dept & meet instructional needs. Renewals possible. No closing date. For all positions write to P. M. Anselone, Staff Selection Committee.

University of PA. Dept of Math, Phila, PA 19104-6395. Prof Jerry L. Kazdan, Chmn Personnel Committee. (1) One or more tenure track positions 7/1/87 for candidates with significant res. achievements & successful teaching of undergraduate & graduate students. Rank & salary depend on experience. (2) Several faculty positions 7/1/87. Required: strong res. credentials & recognition as successful teachers of undergraduate & graduate students. For both positions send resume & 3 reference letters to Prof. Kazdan by 1/1/87.

College of Charleston. Dept of Math, Charleston, SC 29424. William L Golightly, Chmn. At least 3 tenure track asst professorships, Fall 1987. Qualifications: PhD in one of math sciences, commitment to undergraduate teaching & potential for continuing research. Teaching: 9 hrs per week for those engaged in research. Salary competitive. Send resume & have 3 letters of recommendation sent to Chmn.

Univ of South Carolina. Dept of Math, Columbia, SC 29208. Dr. Colin Bennett, Chmn. Tenure track positions at all levels. Will consider all areas of math. Prefer applicants in applied & computational math. Required: PhD & commitment to excellence in res. & teaching at both undergraduate & graduate levels. Dept operates its own computation center (VAX 8300 & 11/750); terminals in each faculty office provide access to VAX complex & to Univ's IBM 3081 mainframes & FPS 264 array processor. Send resume, summary of res. & goals & 4 letters of recommendation to Chmn.

Vanderbilt Univ. Dept of Math, Nashville, TN 37235. R R Goldberg, Chmn. Asst Professorship (2 year appt) Fall, 1987. PhD required. Not tenure track but intended for person with res. potential who would like to spend time in Dept with vigorous res. atmosphere. Especially interested in applicants in fields of numerical algebra, differential equations, graph theory & topology. Have vita & 4 letters of recommendation sent to Chmn.

Rice University. Dept of Math, P O Box 1892, Houston, TX 77251. One or more asst professorships (or higher) in fields of algebra, analysis, geometry or topology. Two Griffith Conrad Evans Instructorship postdoctoral appts for 2 to 3 yrs for one whose interests augment res areas at Rice. One visiting position in fields of algebra, analysis, geometry or topology. By 2/15/87 contact Appts Committee at address above.

Univ of Texas, Austin. Dept of Math, Austin, TX 78712. A number of appts for Fall 1987 at instructor level (new PhD's) and at asst prof level (2 years experience beyond PhD). Required: strong res. credentials. Salaries competitive. By 1/15/87 send vita, summary of res. interests & at least 3 letters of recommendation to Recruiting Committee Chmn at above address.

University of Vermont. Dept of Math & Stat, Burlington, VT 05405. Donald E Moser, Chmn: (1) Visiting Prof or Assoc Prof with strong res. program in algebraic number theory, algebraic geometry, approximation theory, combinatorics, graph theory or harmonic analysis. Send resume, abstract of current res. & names of 3 references to Chmn. (2) Tenure track asst prof. in applied math or areas listed in (1) above. Expect significant res. accomplishments or outstanding res. promise & excellence in teaching. Send resume, transcripts, & 3 letters of recommendation to Chmn.

University of Washington. Dept of Math, GN-50, Seattle, WA 98195. (1) Several tenure track asst professorships (or higher) Fall, 1987. Looking for strong teaching & research records. Prefer those in fields of numerical analysis & optimization. (2) Several 3 yr appts Fall 1987 for recent PhD's of any age with strong res. & teaching potential. Competitive salaries & standard benefits. Send vitae, list of publications & 4 letters of recommendation to Chmn, Appts Committee.

University of Wisconsin, Madison. Math Dept, Hiring Committee, 480 Lincoln Dr, 223 Van Vleck Hall, Madison, WI 53706. (1) Three yr term asst professorships 8/1987. Required: good teaching & outstanding potential for math res. Teaching load 2 courses per semester. Salary at least \$28,000/academic year. Obtain applications from address above. Deadline for full consideration: 12/31/86. (2) Asst professorships (or higher) for candidates of established excellence in res. as well as recent PhD's who exhibit potential for tenure track positions to begin Fall, 1987. Required: strong commitment to good teaching. Consideration of established candidates will begin 11/24/86; that of recent PhD's will begin 12/31/86. Application forms available from address above.

York University. Dept of Math, 4700 Keele St, North York, Ontario M3J 1P3 Canada. Joan Wick Pelletier, Chair. One or more tenure track or limited term positions, rank & field open, 7/1/87. Required: Proven ability or demonstrated potential for res. & teaching. Prefer candidates in stat or operations res. By 1/15/87 send resume & at least 3 letters of recommendation to Chair.

Late Arrivals

Northern AZ University. College of Engineering & Tech, Box 15600, Flagstaff, AZ 86011. Prof Clyde N Holland, Dean. Tenure track asst/assoc professorship in Comp Sci & Engineering. Openings in hardware & software. Successful hardware applicants will teach courses in digital design, computer architecture, computer control & micro-processors. Successful software applicants will teach courses in introduction to programming, structural programming, data structures & other software topics. Doctorate required for asst/assoc rank. Master's will be considered for instructor (not tenured) appt. By 11/1/86 send resume & 3 references to Dean Holland. Search will remain open until position is filled. For information call 602-523-2880.

SUNY - Albany. Dept of Math & Stat, Albany, NY 12222. Joe W Jenkins, Chair. Fall 1987 openings. (1) Tenure & tenure track. Prefer candidates in algebraic number theory & geometry, complex analysis in several variables, geometry/topology, and/or Lie theory. Outstanding res. accomplishments required. (2) Malcolm F Smiley Instructorship. 3 yr position with reduced teaching load of 3 courses a yr. Excellent res. promise required, and also commitment to good teaching necessary. By 1/15/87 send vita & have at least 3 letters of reference sent to above address.

Association for Women in Mathematics
Box 178, Wellesley College, Wellesley, MA 02181
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