Association for Women in Mathematics

Volume 14, Number 4 NEWSLETTER July-August 1985

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NOTE Speakers' Bureau: The new brochure goes to press August 1. Those wishing to join the Bureau at this time should send registration to AWM Office by July 15.

PRESIDENT'S REPORT

Plans for the Kovalevskaia Symposium are going full speed ahead. The local organizing committee is in touch with the Bunting Institute people, and final arrangements will be made soon. The Symposium will have two components. The first, on Saturday, October 26 will focus on the development of modules in applied mathematics for secondary schools. The second will follow the Fall meeting of the AMS in Amherst and will take place on Sunday evening, October 27, and all day Monday, October 28. The theme of this part is the mathematical heritage of Sonia Kovalevskaia. A more detailed announcement appears elsewhere in the *Newsletter*.

The AWM will have a full program of activities at the Laramie meeting in August. There will be a panel on "Ethical Problems in Mathematical Life." Our panel will consist of Anne Leggett, M. Susan Montgomery, Marion Pour-El, Jean Taylor and Gail Young. They will address some of the stickier issues that we deal with in our profession, but don't often discuss in public. We will also have our usual party. All the events will take place on Tuesday, August 13. Check your *Notices* for exact times and places.

Funding Mathematical Research. I'd like to draw your attention to the article by Edward E. David, Jr. in the May 1985 issue of *Scientific American*, and the article on the National Science Foundation Budget in the June 1985 *Notices* of the AMS. Both articles are concerned with government funding of mathematical research. This is an issue of primary importance to all of us. The David article is an offshoot of the study made which culminated in the "David Report", published by the AMS in the *Notices*. In the past, mathematicians have not made their case in public, and this has been extremely detrimental. The article in *Scientific American* is a step toward enlisting broad support.

There is now more real money going into research than there has been for many years. NSF priorities have been changing, and the report has influenced these changes. Grants to individual researchers are a much smaller part of the Foundation's effort. The Research Institutes at the University of Minnesota and Berkeley receive the bulk of their funding from NSF. The Institute for Advanced Study, the Courant Institute and the Mathematics Research Center at the University of Wisconsin now receive more support for visitors and postdoctoral fellowships than previously. The NSF's own postdoctoral fellowship has grown substantially. There is more money for research conferences and workshops as well. There is also a new priority, the funding of computing equipment for mathematicians. Graduate students are being funded by NSF now in greater numbers as well. This is a result of a policy of making big grants even richer.

All this is extremely important for the health of mathematics; however, it means that there is considerably less support for the majority of productive research mathematicians. There is less summer money available to them, less travel money, and fewer of the perks that University and College administrations give to people who are "supported". These run the gamut from easier tenure decisions and lower teaching loads to telephones in offices and availability of xeroxing facilities.

The issue of support is pressing at this time too, because the Reagan "Star Wars" policy has already begun to put money in the direction of mathematics. The supporting agencies in this case not only have the privilege of prior review, but they can also skew the direction of mathematical research in general. Certain topics may become fashionable and receive disproportionate funding from more traditional sources as well.

There are no simple answers to the question of how best to support mathematics. How policies are set is a concern to all of us and is a particular issue for women in mathematics. For example, although they benefit from many of the newer programs, they are still under-represented at the institutions which are receiving the richer grants. We, as women, and men concerned with issues involving women in mathematics, must make our influence felt on those who set policy. These include the officers of the AMS and MAA; Ken Hoffman, Chief Mathematical Lobbyist; John Polking, Director of the Mathematical Sciences Division of the NSF; and members of the National Academy of Sciences.

Some Statistics and Some Congratulations. Last year seven of the thirty recipients of NSF postdoctoral fellowships were women. This year there are two. Congratulations to Leslie Federer at the University of Michigan and Laurette Tuckerman at the Centre d'Études Nucléaires de Saclay.

One of the three recipients of a NATO postdoctoral fellowships in mathematics this year is a woman. Congratulations to Ranee Gupta at Brown University.

None of the Presidential Young Investigator Awards went to a woman mathematician this year.

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LETTER FROM THE EDITOR

Those of you who pay attention to *Newsletter* format may have noticed a number of changes in this issue. For example, the spaces between words are now microjustified, and the apostrophe isn't an acute accent anymore. The apostrophe was corrected by acquiring a WP wheel (what I thought I was buying in the first place!) in addition to the ASCII wheel. The first change mentioned was effected by more drastic means.

That is, we (Gerry and me) are the proud possessors of a new computer. Our Commodore 64 served us well for a year and a half, and it's still great for Flight Simulator and music synthesizing. But we wanted to have the same power at home that we have at our offices. And the speed of the Commodore disk got harder and harder to take in comparison with the office machine. And then we got our copies of Word at the office, and I *really* wanted to use it at home and ...

Anyway, you get the idea. My first word processor was not bad, but Word is going to save me a lot of time, especially on layout.

And there's potential for saving me even more: I can now take submissions on disks (which I will happily return). My IBM PC-compatible machine uses 5-1/4" floppies. Obviously Word files are fine. Word includes a WordStar conversion utility, so WordStar files are also easy to deal with. And, of course, I can format any text ASCII file (it will help if you give your file the extension ".DOC") - I will be reformatting everything uniformly, anyhow.

Jeanne LaDuke will be delivering an MAA invited address, "Women in the American mathematical community: The pre-1940 Ph.D.'s," on Wednesday, August 14, at the Laramie meeting.

AWM is planning a panel session for the I.C.M. at Berkeley next year. The session will be entitled "Women in Mathematics: An International Perspective (8 years later)". Lenore Blum, Mills College, is Chair of the AWM Committee on I.C.M. Panel.

Congratulations are due to Donna Patricia Smith, who has received an NSF Minority Graduate Fellowship for study at the University of Virginia.

Anne Leggett
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Loyola University of Chicago
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TWO CALLS FOR ASSISTANCE

The Women's Studies Program of Rutgers University invites input from AWM mathematicians in the preparation of a course tentatively entitled "Women in the Scientific Professions." Information about updated bibliography, appropriate supplementary media, and syllabi from courses currently taught on other campuses would be most welcome, as well as general feedback about the perceived need for such a course and about specific topics to be included. Please send responses to Dr. Sherry Rosen, Women's Studies Program, Douglass College, Rutgers University, New Brunswick, NJ 08903.

Dear Professor Keen:

COMAP has been funded by the National Science Foundation to develop print, video and microcomputer software materials for mathematics teacher training at the high school level. The High School Mathematics and Its Applications Project (HiMAP) is a five year endeavor, during which time we will produce and distribute 60 modules, 20 pamphlets for the motivated student, 10 video programs and 6 computer discs. We also publish a quarterly newsletter, *CONSORTIUM*, offered free of charge to all high school teachers and as a benefit of membership to college faculty. I enclose our latest issue.

I am very interested in having women mathematicians contribute to the project. As I can see by some of the articles in your June 1985 newsletter, you are well aware of the under-representation of women in the field, as well as being somewhat ignored in the grants and fellowships department. I am also anxious to have women mathematicians seen as role models, active in industry and academia.

I hope that you will reprint this letter in your newsletter so that your members can join us as authors of modular materials and contributing editors to our newsletter. I realize that you are all over-extended as far as your time commitments go, but I hope this project will be seen as an important and far-reaching one.

Please call or write should you have comments, suggestions or questions. Thanks in advance for your cooperation.

Sincerely, Laurie Aragon, Business Development Manager
Consortium for Mathematics and Its Applications
271 Lincoln St., Suite No. 4, Lexington, MA 02173
(617)863-1930

AWM ELECTION

The Nominating Committee has nominated the following candidates for AWM offices: President-Elect - Rhonda Hughes, Bryn Mawr College; Members-at-large of the Executive Committee - Rebecca Herb, University of Maryland; Tilla Klotz Milnor, Rutgers; and Lisa Goldberg, Brooklyn College, CUNY. Statements from the candidates will appear in the November-December *Newsletter*. Nominations by petition (with 20 signatures) should be submitted to the President by September 1st.

TODD LECTURE

by Jeanne-Marie Silk, Montclair, NJ

Olga Taussky-Todd, Department of Mathematics, California Institute of Technology, Pasadena, California, was a speaker at the Second SIAM Conference on Applied Linear Algebra, April 29 to May 2, 1985, Raleigh, North Carolina. The title of her hour-long lecture was "Why I Am Carrying a Torch for Matrix Theory." There were about 400 men and 6 women in the audience. Applause at the end of her lecture surged into a standing ovation of some minutes. She had something of value to offer everybody in her audience. Those who heard her were fortunate indeed.

KOVALEVSKAIA SYMPOSIUM

A symposium in honor of Sonia Kovalevskaia will be held at Harvard University, Cambridge, Massachusetts on Sunday evening, October 27 and Monday, October 28, immediately following the Amherst meeting of the American Mathematical Society. The symposium has been organized by the Association for Women in Mathematics in cooperation with the Mary Ingraham Bunting Institute of Radcliffe College. The academic year 1985-86 marks the fifteenth anniversary of the Association for Women in Mathematics and the twenty-fifth anniversary of the Bunting Institute. This dual occasion provides an apt framework in which to celebrate the mathematical accomplishments of Sonia Kovalevskaia, the first woman to receive a doctorate in mathematics, and to present the work of mathematicians who are today working in related fields.

Sonia Kovalevskaia did some of her most important work, in analysis, applied mathematics, and mathematical physics, just about a century ago. There has been a recent resurgence of interest in her approaches and her results. This symposium will be the first occasion in recent years of bringing together mathematicians to honor her legacy. The lectures will cover a broad selection of topics related to Kovalevskaia's work. These include the following: reaction diffusion equations, theory of vibrations, Hamiltonian systems, dynamical systems and turbulence, Backlund transformations, singularities in Yang-Mills fields, topological entropy, theory of solitons, minimal immersions and submanifolds, geometric measure theory, geometric invariant theory and boundary problems. The speakers will be among the following:

Mark Adler	Brandeis University
Patricia Bauman	Purdue University
Nancy Hingston	University of Pennsylvania
Ann Hibner Koblitz	Moscow State University (visiting)
Nancy Kopell	Northeastern University
Linda Ness	Carleton College
Michael Shub	Queens College (CUNY)

Jean Taylor	Rutgers University
Chuu Lian Terng	Northeastern University
Karen Uhlenbeck	University of Chicago.

The symposium will begin on Sunday evening, October 27 in Cronkhite Hall, Harvard University, with registration from 5 to 7 p.m. and dinner at 7 p.m., followed by the opening lecture. The program will continue through Monday, October 28. Note that three of the Special Sessions at the AMS Amherst meeting (October 26 and 27) will be coordinated with the Kovalevskaia Symposium. They are:

An introduction to quasi-crystals, Jean Taylor, Rutgers University

Non-linear problems arising in physics and geometry, Lesley M. Sibner, Polytechnic Institute of New York

Sonia Kovalevskaia, major currents in 19th century mathematics; Jane Cronin Scanlon, Rutgers University.

The Organizing Committee for the Kovalevskaia Symposium consists of:

Linda Keen*	Herbert H. Lehman College (CUNY)
Linda Rothschild*	University of California, San Diego
Bernice Auslander	University of Massachusetts, Boston
Pamela Coxson	Mary Ingraham Bunting Institute, Radcliffe College Harvard University
Michele Vergne	Massachusetts Institute of Technology.

*Cochairpersons

Registration fees are: $3 for AWM members
$5 for non-members
$1 for students or unemployed.

A block or rooms has been reserved for participants in the Symposium at the Quality Inn, 1651 Massachusetts Avenue, Cambridge, MA 02138. Reduced prices of $60 for single rooms and $71 for double rooms are available if booked before September 26. Early booking is advised, and the Kovalevskaia Symposium must be mentioned in making reservations. The telephone numbers are 1-800-321-2828 and 617-491-1000. Additional information about other accommodations (including bed-and-breakfast) will be sent upon request. Reservations for dinner on Sunday, October 27 must be made before October 13. The form below (or a xerox of it) should be sent to Margaret Munroe, AWM, Box 178, Wellesley College, Wellesley, MA 02181.

I wish to attend the Kovalevskaia Symposium. My check, payable to AWM, is enclosed.

________Registration fee
________Dinner, Sunday, October 27, 7 p.m. ($17.50)
________Please enroll me as a member of AWM ($10)

________TOTAL

Name______________________________ Address______________________________

Telephone______________________ ______________________________

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______Please send me additional information about accommodations.
______I will need transportation from Amherst to Cambridge on Sunday, Oct. 27.

DEATH NOTICE

AWM member Professor Sylvia Pines, Chair of the Assembly of State Conferences, American Association of University Professors, passed away on Sunday evening, May 5. Sylvia had had heart surgery the previous week and was making excellent progress in her recovery, but complications developed on Sunday morning. She is survived by her husband, Samuel, two daughters, and a son.

Sylvia made an outstanding contribution to the AAUP, and her wise and dedicated leadership will be greatly missed by the Association.

IN THE PIPELINE

The continuation of "In the Pipeline" has been postponed till next issue so that the AWM panel report below can be included all in one issue.

NON-ACADEMIC CAREERS IN MATHEMATICS

The AWM panel held at the Anaheim meeting on January 10, 1985, was titled "Non-academic Careers in Mathematics." It was organized, moderated, and edited by Pat Kenschaft of Montclair State College, New Jersey.

Our first speaker is Bonnie Saunders from Star Consultants. She received her doctorate in operator theory from the University of California at Berkeley.

After finishing my degree in 1978, I first taught for two years at the University of Wyoming. It was more or less a time of getting up enough nerve to look for a job outside of academics. In 1980 my husband obtained a job in Houston and I moved there. I was told that if I couldn't get a job in Houston I was hard-core unemployable.

Fortunately, at that time it was very easy to get a job with the oil industry. So I went to work for Texaco in the geophysical research department. After three years there my husband got a different job in New Jersey. While we were preparing to move, my supervisors at Texaco suggested that I continue working for them on a contract basis. So for the last year and a half I've been working for them in my home. I have my own computer, call up the Texaco computers and program them, and about every two months fly down to Houston to talk with people and give reports.

My work for Texaco involves seismic exploration. Disturbances are created at the surface of the earth and echoes reverberate off various geological layers below the surface. From the data collected by listening to these echoes you try to interpret what is going on beneath the earth--hopefully where there is oil or gas. I've done various different jobs for Texaco associated with this problem.

I started just doing data processing, learning the different processes applied to the data as it comes in and also learning something about how to interpret data, doing a lot of digital signal processing. If I was trained for anything in this field, it was for that, because it's really just harmonic analysis on finite groups. I also taught at their basic geophysics school. I mention that for those of you who are contemplating a nonacademic career but enjoy the teaching part of your career. It doesn't have to end. We did a lot of in-house teaching. You meet people who still don't know how to solve linear equations and you try to tell them how to do it.

I worked for a while in a graphics group doing an interactive graphics project, which was really very non-mathematical. It was a lot of fun, playing around with such things as drawing pictures on computer screens, but it got boring for me after a while so I switched into a group that does wave equation applications. This is where I feel most at home, and where I've been working since I left.

I try to analyze the data using the wave equations to accomplish whatever processes we want. There are several types of problems. For example, you can create a model of the earth and then use the wave equations to try to actually generate synthetic data. Then there's a process called migration, which is sort of a fake inversion process. The data comes to you in time. You don't know where the reflector is; you only know how long it took the reflection to get back to the receiver. You want to convert that data to depth, that is, determine where the reflectors are, and the process called migration does that. Of course, what we would really like to do is a complete inversion, but that kind of thing is hard enough given simpler models and cleaner data than found in exploration geophysics. It is, however, an example of an interesting and current mathematical problem that is of interest to the oil industry.

The type of mathematics I use in my work is different from the theoretical mathematics I studied; I'd say that it tends to be broader and less in-depth. I need the Fourier analysis that I learned as an undergraduate, rather than as a graduate. During the time I have been working in geophysics I have learned, as needed for the problems I think about, some PDE's, some numerical methods, some physics and geology, and lots of programming. In all, I found it a much more varied and interesting career than attending to purely mathematical problems.

Our second speaker is Maria Klawe, who is Discrete Mathematics Manager at the IBM San José Research Laboratory. She received her degree in functional analysis from the University of Alberta.

I'm sure that most of you didn't know that IBM had a Discrete Mathematics Manager, so I'll start by telling you what that title really means. I am manager of the discrete mathematics group, which is part of the computer science department in the IBM San José Research Laboratory. Our mission is to do pure research in any one of a number of areas of pure mathematics, including combinatorics, logic, number theory, operations research, and algebra. The only restraint is that the research should have some connection with computer science. Most often, this connection occurs through interaction with the theoretical computer science group in our department. We believe that pure mathematicians have an enormous contribution to make to the field of computer science because many computer science problems are now so mathematically sophisticated that very few computer scientists have sufficient mathematical background to solve them. Our group of pure mathematicians is particularly fortunate in being exposed to the problems arising in computer science and having the freedom to explore the mathematics the problems generate.

Our work mostly consists of what one would do in the research environment of a university--choosing one's own problems, and hopefully solving them, writing them up and giving talks at conferences. We also, when needed, act as consultants to the rest of IBM in our own particular area of expertise, though that tends to take less than five percent of our time at most. Another responsibility is to interface with academia, helping with recruiting and stimulating joint research projects. For example, we try to know who are the best graduate students in our areas, and to encourage their interest in working for IBM.

How did I end up in this situation? I finished my Ph.D. on amenable semigroups in 1977, and like many people who received their Ph.D. that year, I wrote about eighty letters to universities and received very few offers. Taking the best offer, I arrived at a small university in Michigan. Although there were many good mathematicians in the department, the students were terrible! During the eight months that I spent there, I really could not believe that this was what I had gone into mathematics for. I was very, very frustrated (I'm sure that this is a familiar experience to many people). I was so frustrated that in eight months I went to eight conferences, just to get away from that environment.

At one of these conferences I met Vasek Chvatal, a combinatorialist I'd heard wonderful things about. To my surprise I found that he was teaching in a Computer Science Department (Stanford). While telling him horror stories about the situation at my university, I noticed that he was continually getting phone calls from computer science students finishing their Ph.D.'s who wanted his advice about which job offer to accept--MIT or Bell Labs, etc. I sat there wondering , "Oh my God, what did I do wrong with my life that sentenced me to live forever in the middle of nowhere teaching students who could not add a half to a third?" I asked Vasek if these students getting such wonderful offers were all so spectacular. He said, no, they were good, but not exceptional. I commented bitterly on the unfairness of life, but Vasek replied that if I wanted offers from Bell and MIT, all I had to do was to learn some computer science. I was desperate enough to take this seriously, and asked which were the best computer science departments. He replied MIT, Stanford, and the University of Toronto. By this time it was March, and Stanford had closed its enrollment January 15. MIT said, "Fine, you can come, but we have no money to support you." Toronto, perhaps because I'm Canadian, said, "Great, we'd love you to come. We can support you and there's no problem." I went to Toronto.

I spent the next year taking enough graduate courses for a Ph.D. in computer science. When I arrived, I knew no computer science. Before that year I'd never programmed, never read computer science books, and honestly had no idea what computer science involved. On the whole I hated that year. Partly it was because I was taking so many courses, but even more because it was a different culture. I was used to proofs, theorems, and above all, rigor. In computer science there is some of that, but there's an awful lot of other stuff.

By the end of the year I'd learned a great deal and was suddenly employable anywhere. It was a remarkable change. I just could not believe the difference, because in computer science I'd done no research, yet I too could have wonderful offers. I joined the faculty at the University of Toronto and then met someone I wanted to marry, who happened to be working for IBM research. We considered whether he would come to Toronto, we would both go to MIT, or I would go to IBM. In the end I decided to go to IBM, mostly because having made such a change in my area of research, I wanted to have time to concentrate on research and establish myself in another field.

I found there were many things I loved about being at the IBM San José Research Laboratory. There is an enormous amount of freedom. It is wonderful to be able to concentrate on research. One major objection I had, however, was that I felt the computer science department did not appreciate the potential contributions that mathematicians could make. More than once, when an outstanding mathematician expressed an interest in being hired, we took no action. Finally I decided that instead of fighting to hire individual mathematicians, I would try to convince high-level management to start a mathematics group, establishing the importance of hiring mathematicians into a computer science department for once and for all. Last August, that group came into existence. It took a year of my life, but it was worth it.

I have only thirty more seconds, so let me finish by briefly mentioning the attributes that I think are necessary to work in this kind of group. First of all, you have to be willing to talk with non-mathematicians, and be interested in listening to mathematical problems that come from other areas. You have to be very flexible. You have to be willing to learn a lot of things that might not seem interesting on the first round, but end up generating good problems. I think you have to be more of a problem-solver than a theory-builder.

Most of the mathematics I do now is combinatorics. I personally am most satisfied when I solve a problem which I think is genuinely difficult and interesting and whose solution is clever. I'm not saying that I think all mathematicians do or should share my values. Fortunately for the future of mathematics not everyone is like me--many people have better taste and more interest in deep structures. However, for interfacing between mathematics and an applied area, I think it's useful to have both a love for pure mathematics and a love for solving problems for their own sake.

Our next speaker is Elizabeth Ralston of Inference Corporation. She received her doctorate from Yale, with a dissertation on finite group theory.

From many points of view I have what I feel is almost an ideal job for the academically-trained mathematician working in non-academia. I'm working for a small, start-up software company called Inference Corporation. So far we have two products. One is artificial intelligence software designed to assist in building expert systems. The other is a computer algebra program--Symbolic Manipulation Program, or SMP. This is the product I'm working on. It is designed to assist physicists, engineers, and mathematicians to do mathematical computations symbolically. What I'm working on now is modifications, enhancements, and improvements on the existing software. This involves both design and implementation of new code.

How did I end up here? I finished graduate school in 1970, which was just about the time the job market was starting to dry up, although it was probably not as bad then as later. After a one-year job in New York, my husband and I moved to southern California, where I got a job at a state college in the Los Angeles area. Probably because of the job situation at the time, the prevailing attitude in the administration was, "You're lucky to have a job at all, and if you don't like it here you can quit." There were a number of things I didn't like about the job, one of which was--I certainly have to agree with Maria--the students, who also couldn't add a half and a quarter. So after two years when I got a temporary offer somewhere else, I decided that getting tenure on those terms was probably not worth it, and I did quit. I had a couple more temporary jobs over a period of about three years, by which time the job market in academia had really dried up. At that point I began my search for non-academic employment.

The first non-academic job I took was with the Aerospace Corporation. This is a not-for-profit corporation which does general systems engineering on Air Force space programs. Basically what this means is that Aerospace does technical studies and provides technical advice for the Air Force. I was referred to Aerospace by a friend of a friend who was working here. The point is that in the search for non-academic (or probably any type) employment, it is almost always better to try to circulate your résumé or vita through some personal contact, regardless of how tenuous it may be. During the time I was at Aerospace, probably about two-thirds of the people who were hired into the department were hired through some type of personal referral. This is not to say that it's impossible to get a job through some other method, but it really helps to have a referral. I think it's particularly true if you're in a field like mathematics where you have relatively non-specific job skills and are making a career transition.

My job at Aerospace also illustrates another fact of life, which is that in southern California most of the technical jobs are in defense-related industries. It is also the case that defense contractors or large corporations are the ones who will have sufficient funds to pay for someone who (like me at that time) is going to have to be trained.

You might ask what kind of mathematics I used when I was at Aerospace. I used to tell people who were being interviewed "basically calculus and linear algebra with a smattering of elementary--very elementary--probability and statistics." So I would have to say--and perhaps there are some exceptions to this--that in general you should probably not go into non-academic employment if you want to be on the frontier of mathematical research.

Then why should one hire a Ph.D. in mathematics to do calculus and linear algebra? It may be that most people with undergraduate degrees in mathematics, and certainly most people with undergraduate degrees in engineering, don't really know undergraduate mathematics. So Ph.D. mathematicians have an advantage.

Anyway, at the start I would be given some specific, semi-mathematical problems to solve. Since this was basically an engineering company, the problem very often had been distilled from some engineering problem and put into mathematical form. What I quickly found out, and what I think most people in this situation find out, was that in most of these cases it is important to get back to the original problem. This is because in attempting to simplify and extract the mathematical content, other people very often obscure totally the original problem, and the reformulated problem may have nothing to do with the actual problem.

At one point a few years after I had been at Aerospace I was given a problem which was basically in the form of: find numbers a and b so that there are no integers n and m such that a times n equals b times m. I said, "This is fine, you just make the ratio of a and b irrational." And then I thought, "Having the ratio of two numbers irrational is not a physical property." So I eventually found the person who originated this problem, found out what the real problem was, and we went into an interesting and fruitful collaboration.

Basically, I thought Aerospace Corporation an extremely pleasant place to work. Initially I was in a department which included five or six Ph.D.'s, and this number grew as time went on. In fact, during the time I was there the number of Ph.D.'s in mathematics who were hired throughout the company seemed to be increasing. I think there may be a couple of reasons for this. One was probably that as Aerospace started to have success with the Ph.D. mathematicians they had hired, they were more willing to take on others. It probably also had something to do with the revival of the aerospace industry and the shortage of trained engineers at a time when mathematicians were available. Anyway, with Ph.D.'s as colleagues I found the level of intellectual stimulation on a day-to-day basis a lot greater than I did when I was teaching calculus and pre-calculus and pre-pre-calculus to students who had failed in high school.

Gradually the work I did became less specifically technical or mathematical and more in the nature of evaluating outside contractors' proposals of work. I mentioned that Aerospace has a consulting role for the Air Force. It does not actually produce any hardware or software as a deliverable product. This has both advantages and disadvantages for a technical person employed there. On the one hand, you get to see large projects from a fairly high level, whereas if you were working for a company building a particular system you would typically be a very small cog in a very large wheel. On the other hand, after working there for several years I began to feel like a kibbitzer on these projects, in that I was offering advice and suggestions but never had the responsibility for seeing something through to a conclusion.

About two years ago, therefore, I decided I should look for a job change. I was looking specifically for a company that had a product and preferably one that was not involved in the defense industry. The place I chose to work for next was a company called Transaction Technology Incorporated, or TTI. TTI is a subsidiary of CitiCorp and does the on-line banking systems for CitiBank in New York. The project I worked on was home banking. I worked on questions of security (encryption of data and the personal identification code) and also on simulating the microcomputer network which was designed to service a home banking network. Any one of these types of quasi-mathematical analysis could just as easily have turned up in the Aerospace-type environment.

I must report however a rather sad fact from a mathematical point of view, something which I saw in my Aerospace experience as well. When you start modeling, the success of the model depends far less on the mathematical sophistication of the model than on being able to obtain some reasonable input data for it. I think that this is something that mathematicians often find when they start working on real problems. This is something that has been mentioned before: you have to make compromises on mathematical purity and concentrate on getting answers to the specific question that has been asked. My stay at TTI lasted until last summer, when I joined Inference Corporation, where I've been for the past six months.

Our next speaker is Margaret Waid, manager of Production Services for NL Sperry-Sun. She received her Ph.D. from Texas Tech in Lubbock, specializing in partial differential equations.

I brought my props with me. While I was a university professor for about ten years, one thing I learned is that you have to get the attention of the audience, and you have to get the attention at the time you are saying something important. What I did today was to wear the coveralls and the hard-hat that I wear out to the field when I'm going out on oil rigs, land rigs and off-shore rigs, in the Gulf or off-shore California or in the North Sea. Before I make my point, I want to tell you--in case you don't know--that one of the big differences between on-shore and off-shore rigs is that off-shore rigs have bathrooms.

Now that I have your attention, I want to make my major point of the day: if you decide to work in a non-academic position, you must not regard the company's capital as a substitute for a research grant, and you must not plan on spending your time sitting behind your desk waiting for someone else to define the problems and bring them to you so you can apply your mathematics to them. It doesn't work that way. If you decide that you want to work in an industry (such as, for example, the oil services industry where I work), then when you go for an interview, you must make sure that the people you are talking with know that you are very excited about that industry. You've already done your homework and learned a lot about it, you know what you're getting into, and you're very much interested in getting out into the field and participating in delivering the service, understanding and defining the problems, and then helping to solve the problems.

Just a little bit of background. I spent about ten years at the University of Delaware working on partial differential equations. Because it followed from my thesis work, which involved fluid flow through porous media, some of what I did was working with problems involving reservoir analysis. I decided I would leave a comfortable tenured position and go into the oil field because what I was really interested in doing was the applications, and what I found out was that I didn't even have the right people to talk with where I was. And I couldn't attack the problems properly because the problems were not well-defined, and the reason they weren't well-defined was because nobody really know how the problems should be defined. And so I simply could not have problems laid on my doorstep, and what I needed to do was go to the source of the problems.

So I left academia and spent three years working for Schlumberger as a Senior Development Engineer. When they asked me about my programming I didn't answer the question, basically because I knew mathematicians could do anything, including learning how to program. Very soon, of course, I was writing my own programs and nobody really knew the difference. One of the things I did do at Schlumberger was modeling tools that are used for logging wells. They use nuclear tools, electrical tools, and mechanical tools to make measurements concerning the formations, and then they use this information to determine where the oil is and how to produce it. What I did at Schlumberger was modeling the response of all tools that involved pressure and flow measurement. And I did *not* hide behind my desk; I spent as much time talking with the engineers who were designing the tools. I wanted to influence the designing of the tools because I felt that I often could solve a complicated mathematical problem by simply designing the tools properly and just eliminating the problem. It took a lot of educating the engineers for them to understand this, because they felt they should design a mechanically sound tool and it was the mathematician's job, or the theoretical modeling engineer's job, to try to figure out how to interpret the response of the tool. It took a lot of educating of those people; I did as much teaching as I did at the university, but I had a more willing audience in industry because they were ready to listen. They were indeed receptive; they got to the point where whenever they were thinking of a basic design or making a design change, they got in touch with me because they wanted to know how this was going to affect the interpretation. We designed some tools that mean now the proper information will be gathered so that the mathematical models which have developed will be able to be used.

After three years at Schlumberger, I was very interested in management. Schlumberger is a French company, and they're not too interested in having women as managers. So I joined NL Sperry-Sun as Supervisor of Software and Analysis in charge of all their computer software. I had never taken a programming course; I just learned on my own at Schlumberger when I needed to, and I don't think the people in industry ever really knew the difference.

As Supervisor of Software and Analysis, I was then in a position where I was able to get out into the field. (Actually I did at Schlumberger too; I designed field tests and went out on lots of rigs.) In the field I discovered that by being able to talk to the customers on sales calls and the engineers who were actually delivering the services, I was able to see how to define the problems, to see what the problems were, to determine what tools were actually needed and what software was necessary to make the measurements that were needed. As a result of all this, the fancy reservoir models that are in use at Exxon, and Shell and Texaco, will actually have good information, proper parameters, to fit into the model. I have talked quite a lot with the people who are in the research departments of the major oil companies as well as the engineers who are designing the tools. I determine the specifications for the tools so that they actually get the information which we need.

The point I am trying to make is that you have to go out there. You have to talk with *all* the people who are involved. You have to look at the entire system. Mathematicians can do that, but when you join a company, they don't issue you a hat and a pair of coveralls. They don't tell you that what you really need to do is to go into the field and talk to the engineers. They just say, "How are you?" and expect that you already know that and that that is what you are going to do. They expect you to be self-motivated.

When you go to interview such a company, you should become extremely interested in the industry. You need to start looking at the journals of that industry. If you are going to interview in the oil industry, for example, you need to know the oil and gas journals. You need to know that the professional societies of the people in that industry are the Society of Petroleum Engineers and the Society of Professional Well Log Analysts, and you have to learn what their journals are and study those to see where you would fit in that organization. You have to learn the language even to be able to go and interview.

I was recently promoted in October to Manager of Production Services, so I manage one of their two main product lines worldwide. I have an R&D department working for me, and an operations department, and the people who deliver the services--that is, the sales people--and I am in a position to do the things I think really ought to be done. I thought, "We really need to get people in here with good mathematical background to do the kind of job that needs to be done." I got approval for the openings from upper level management, and I recruited some of my friends from academia that I knew wanted to leave academia. I knew that they could do these jobs, but they absolutely and totally bombed in the interview. The reason they bombed is that they didn't do their homework. They didn't learn the language and terminology that they needed, and they couldn't convince the right people that they were actually going to go out where the problems are. They couldn't convince the people that they even had a good feeling for the industry and what they could do that would influence the bottom line. It's really important if you're going to look for a non-academic job that you do your homework. Find some people in the industry and talk to them, and read the journals.

It is also important for women--I'm speaking mainly to the women in the audience now--to get into a company where they are not discriminated against, where they can follow a career path that is good for them as individuals. That's what they're entitled to. One reason I left the university was that--if I had stayed in academia, I would have stayed at the University of Delaware. It was a nice place to "work." But I view that entire industry as being a very discriminatory industry and it's *not* a good place for women to be. That was one of the main reasons I left. I left Schlumberger for that reason, and I went to NL industries. And I don't find that situation at NL industries--anywhere at NL industries.

I have finally come to the conclusion that women should follow the career path that is good for them. And if it is not clear that an industry wants or "needs" you, your expertise and talent, then go find one that does! I am convinced that the opportunities for women exist in those industries which are trying to "make money," as opposed to service industries such as academia, government work, etc. That is because decisions are based upon "getting the job done" and the "bottom line." With the economy in the shape it is in, we are talking about *survival* of companies in the market place. There is a real shortage of technically qualified middle managers in this country. Men don't mind working for women these days. The older men bear it because they are interested in remaining employed. The younger men will work for anyone they respect and who respects them, gives them recognition, and pays them what they deserve. Upper management wants people who can get the job done. Technically qualified women with management skills have an opportunity to do those jobs if they go about it in the right way. In this day and age the losers are the people who do not recognize them, and the industries and companies who cannot recognize the talents of the women working for them. So let them go down the tubes!

Our last speaker is Fred Keene, who obtained his doctorate in representations of Lie groups at the University of California, Berkeley. He is now with TRW Systems.

One of the nice things about speaking last is that everyone else has made your points for you so you don't have to emphasize them very hard. I don't use a whole lot of mathematics. Most of what I end up doing is at the undergraduate--or occasionally at the master's--level. But it almost always is something I didn't know anything about until my boss said, "Hey, I've got this problem."

For example, shortly after I first started working for TRW, my boss wandered into my office and said, "I'd like you to write a program to solve the traveling salesman problem." I thought for a while and I said, "Oh." I did a little reading in the library and talked a little more with him about what he wanted. Then I did some more reading in the library and I found some algorithms that could solve a thirty-city problem, and that turned out to be what he was interested in.

So I found some algorithms that would enable one to make a stab at this. Now, I didn't know anything about the traveling salesman problem other than its formulation before he asked me to do this. Nevertheless, I sat down and wrote a program and it worked out pretty nicely. We integrated it into a larger program, discovered that the larger problem had been formulated incorrectly, and so we filed everything away. Later on I found that this was a standard problem assigned to upper division computer science students and that if I had gone to almost any upper division computer science student, they could have pulled a program out of their files. Unfortunately, theirs would have been in PASCAL. We had such a student working for us who translated mine into PASCAL, and she said mine ran faster than the standard answer they were using in their course and that their instructor was furious. This is the kind of thing that can happen to you.

No one has ever asked me to do anything that involved a Lie Group. I would be stunned if they did. One of the things that people in industry know about mathematicians is that they are reasonably bright. They can *learn* things fairly quickly. If you think a minute, that is what we've been trained to do--to learn things fairly quickly. And we're not afraid to look at complex technical systems because that's another thing we've been trained to do. As more mathematicians go into industry the managers are learning that this is the case--and that we can do some things that are useful to them. Now, we must go out and get the appropriate data. They never seem to ask you the problem and give you the numbers that you need. You always have to go out and find them, and then you find those probably were wrong, so you go out and talk to other people until you finally get the numbers you need. You do indeed have interesting technical problems, but they are never anywhere out near the frontiers of research.

There are some pretty nice things that I have found compared to my seven years of teaching. After five or six years, I decided I was never going to get a job at a school where I was doing anything other than wasting my time, so I figured I would go out and do things at a higher level, at least, than the pre-pre-calculus courses that were mentioned earlier.

One of the feelings I've had since I moved into industry is that I have a lot more control over my life. I was stuck teaching at relatively poor state colleges in southern California--relatively poor schools with relatively poor students and absolute *turkeys* for administrators. When I moved into industry, I found that more than one company was interested in me and the managers were significantly more competent than the deans. There was a possibility of moving from one area of the country to another and having some choice over where I lived. This gave me much more of a feeling of having some control over my own destiny.

I still can't afford a house in Los Angeles. On the other hand, I have a feeling that if I wanted to move to another part of the country, I could find a job there that was interesting and that the people there would be interested in me and what I can do.

As to courses that I would have found useful if I had had an opportunity to take them: I'd have taken more probability and statistics. I *taught* a numerical methods course, and never needed any more than I learned in that course. One area that I didn't even realize existed is called "optimization and estimation." It belongs to electrical engineers and operations research people, but it's really just mathematics. It's a field I am having to learn for myself and it's something I wish we as mathematicians could go back and recover. It's an area that I use a lot, along with most other people I know. In my department there are two other people with doctorates in mathematics, one in topology and one in measure theory, and we all have had to learn about optimization. It starts out with linear programming and gets sophisticated very quickly. This is an area I'd like to know more about and that I would find particularly useful.

The other thing that has been mentioned earlier is that if you're trying to find a job, you're almost always better off if you have had some kind of technical contact within a company. The primary purpose of the personnel department is to tell you, "No!" I have indeed gotten job offers through personnel departments, but it tends to work a lot better if either a friend or a friend of a friend is there who you can ask to pass your résumé around. Don't be embarrassed to do that. TRW will pay me $500 if they hire anyone whose résumé I initiate. This is not unusual. The woman who got me my first industrial job received $2000 for passing my résumé around. Don't be embarrassed to ask. It's something they're supposed to be doing and they'll probably end up getting a little extra money for doing it. So if you know someone "over there," this is the easiest and best way to get your résumé passed around.

The other problem with the personnel departments, of course, is that they have no idea *where* to send your résumé. You're a "mathematician." What in the world is that? Who? We don't have anyone on our organization chart who does that! But it turns out that they have many people who are interested in that kind of skill.

NSF NEWS

NSF Visiting Professorships for Women

The objectives of the program NSF Visiting Professorships for Women are to provide opportunities for women to advance their careers in the disciplines of science and engineering supported by NSF, to provide greater visibility and wider opportunities for women scientists and engineers employed in industry, government and academic institutions, and to provide encouragement for other women to pursue careers in science and engineering through the awardees' research, lecturing, counseling and mentoring activities.

Awards are made to enable experienced women scientists and engineers from industry, government and academia to serve as visiting professors at U.S. academic institutions. The functions of the visiting professor are to conduct research at the frontiers of her discipline, *and* to serve as a role model, teacher, counselor and mentor in the sciences and engineering. The candidate is responsible for selecting and making all arrangements with the host institution. Proposals will compete for awards on the basis of 1) the scientific merit of the proposed research, and 2) a specific plan for lecturing, mentoring and counselling activities.

To be eligible to compete an applicant must hold a doctorate in a field of research supported by NSF (or have equivalent experience); have independent research experience in the academic, industrial, or public sectors; be currently or recently affiliated with a U.S. institution; and not have a salaried position (or the promise of one) with the host institution at the time of application. Members of minority groups and the physically handicapped are encouraged to submit proposals.

Awards may range from one academic semester to 24 months, full- or part-time, with the usual period being one year. Application deadline is October 1; award announcement, April 15 (following proposal submission); earliest starting date, June 1 (following proposal submission); and latest starting date, June 1 (of the following year). Program announcements will be mailed to university research administrators, chairpersons of science and engineering departments and others. Single copies may be obtained from the National Science Foundation, Washington, DC 20550.

NSF Minority Research Initiation

The National Science Foundation's mandate to ensure the vitality of the Nation's scientific enterprise includes responsibility for the quality, distribution and effectiveness of the human resource base in science and engineering. The Minority Research Initiation (MRI) program is part of the Foundation's overall effort to promote full utilization of all highly qualified scientists and engineers. The objective of MRI are to encourage the establishment of independent research projects by minority scientists and engineers and to increase the participation of minority researchers in all programs of the Foundation.

The MRI program accepts research proposals in all scientific and engineering disciplines supported by the Foundation. Prospective investigators are encouraged to discuss the process of developing proposals with the MRI program director and the NSF program officers in the research disciplines.

Research initiation projects normally will be supported for a period up to three years and may be extended for up to two additional years of support without additional peer review, if warranted by evidence of publications, invited lectures, seminars or other outcomes demonstrating the significance and promise of the research to date.

There is no upper limit on the size of MRI grants. However, the size of awards will be consistent with the general level of awards in the Foundation's research programs in the relevant disciplines.

General inquiries concerning the MRI program should be made to the MRI Program Director, Division of Research Initiation and Improvement, Room 1144, National Science Foundation, Washington, DC 20550; telephone (202)357-7350.

Positions Open

Applicants for the following positions should submit résumés including current salary to NSF, Personnel Administration Branch, Room 212, 1800 G Street, NW, Washington, DC 20550; Attn.: Catherine Handle, 202-357-7840. Hearing impaired individuals should use TDD 202-357-7492.

Specific years of successful scientific research experience beyond the Ph.D. are required for the following positions in all fields: Program Director, six to eight years; Associate Program Director, four to six years; Assistant Program Director, three to four years.

NSF's Division of Computer Research is seeking qualified applicants for the positions of assistant program director, associate program director and program director for Theoretical Computer Science and for Intelligent Systems. The positions will be filled on a permanent, temporary or rotational basis. Salaries range from $35,000 to $50,000 for assistant program director; $40,000 to $60,000 for associate program director; and $45,000 to $68,700 for program director.

The incumbent will be responsible for or assist in the planning, coordination, and management of basic research facilities and other scientific activities primarily through Federal grants and contracts to academic institutions and nonprofit, nonacademic research institutions. A broad, general knowledge of computer research and some administrative experience are also required. For technical information about the positions contact Kent Curtis, Director, Division of Computer Research, 202-357-9747.

NSF's Division of Mathematical Sciences is seeking qualified applicants for positions which periodically become available. These positions will be filled on a one- or two-year rotational or temporary basis. Incumbents will be responsible for the planning, coordination, and management of basic research activities primarily through Federal grants and contracts to academic institutions and nonprofit, nonacademic research institutions. A broad, general knowledge of the field and some administrative experience are required. For technical information about the position contact John Polking, Director, Division of Mathematical Sciences, 202-357-9669.

Materials Development and Research

In keeping with its leadership role in maintaining the vitality of American science education, the Directorate for Science and Engineering Education, National Science Foundation, has established several programs for development and research in science and mathematics education. Support is provided for projects relevant to all precollege levels, K-12.

Beginning in 1985, the Foundation is focusing especially on projects that will strengthen science and mathematics education for students at the middle/junior high and elementary school level, the critical early years when concepts, attitudes, and aptitudes are shaped for life. Proposals relating to the high school years, however, will still be welcome.

The NSF's programs in materials development and research are oriented toward the combined objectives of preparing all students for living in a high technology society and of increasing the number of students adequately prepared to pursue higher education in mathematics, science, and technical fields. The attainment of both these objectives is dependent on the widest possible involvement of active and productive scientists and science educators.

The NSF has, for some time, also been concerned about the under-representation of women, minorities, and the physically handicapped in careers in mathematics, science, and technology. Projects involving women, minorities, and/or physically handicapped persons as part of the staff or as target audience are especially encouraged, particularly if they represent models for increasing the numbers of qualified young people in these groups who are encouraged to choose careers in mathematics, science, and technology.

There are four programs within the Division of Materials Development and Research: Instructional Materials Development, Materials and Methods for Teacher Preparation, Applications of Advanced Technologies, and Research in Teaching and Learning. Program and division boundaries are not rigid. Projects that cut across such boundaries to help solve well-documented problems efficiently and effectively are welcome as well as projects that address a single program area. Also the examples of possible projects given under program descriptions are intended only as a guide. Other ideas that address program areas are encouraged.

Instructional Materials Development: This program provides support for the development of new or improved instructional materials in science, mathematics and technology for elementary, middle, and/or secondary level students and their teachers. The program encourages the development of materials that fill content gaps in previously developed curricula, present new approaches to the study of traditional subjects, introduce recent discoveries, or demonstrate applications of scientific and mathematical concepts. An important goal is to involve the most capable scientists and science educators in the nation in the process of upgrading the quality of the science and mathematics materials used in precollege classrooms.

Materials and Methods for Teacher Preparation: This program supports the development of creative new materials and model programs that are designed to improve the preparation of undergraduate students to become elementary or secondary school teachers of mathematics, science, and technology; the development of creative new materials and model programs that are designed to provide effective continuing education to teachers of mathematics, science, and technology throughout their careers; and the development of creative new materials and model programs that are designed to enable individuals of high ability in mathematics, science, and engineering to enter teaching at the precollege level.

Applications of Advanced Technologies: This program supports research and development on the application of advanced technologies - particularly the computer - to science and mathematics education. Support is provided for the exploration, development, and proof-of-concept demonstration of advanced computer and telecommunication technologies utilization in education. Projects may focus on technology as a tool, a medium, or an object of study. Among the anticipated products are innovative educational systems, authoring languages, problem solving tools, courseware, microworlds, tutors, and expert systems that increase the efficiency and effectiveness of instruction at all levels.

Research in Teaching and Learning: This program supports basic and applied research on significant factors that underlie effective teaching and learning of precollege science, mathematics, and technology. Anticipated outcomes include knowledge of how students learn complex concepts in science and mathematics, of how they learn to apply these concepts effectively in real problem-solving situations, and of those factors that are most influential in governing their participation and performance in school science and mathematics courses.

Proposals to the Division of Materials Development and Research may be submitted at any time. However, the following target dates for submission are strongly suggested: for support beginning October 1, proposals should be received no later than February 1 of the same year; for support beginning June 1, proposals should be received no later than October 1 of the previous year.

For more information, write NSF, Washington, DC 20550 and ask for publication NSF 85-10.

GIRLS CLUBS' ACTION AGENDA

press release

According to the U.S. Bureau of Labor, women head 17 percent of all families and 47 percent of all poor families.

"For the future economic health of this nation, and the well-being of 21 million American girls, these statistics must change," says Margaret Gates, National Executive Director of Girls Clubs of America (GCA). "In view of the urgency of this challenge, GCA will release an action agenda providing concrete steps for achieving positive changes in the family, the schools, the community, the workplace and the nation at the first national conference on the state of the American girl [held April 26, 1985 in New York City]. Money is at the core of improving the number and status of girls' programs, but attitudinal change is also essential."

The hard-hitting action agenda contains nearly 50 ways to improve the social and economic status of girls and girls' programs. Any parent, community leader, or other individual concerned with the special needs of girls can use the techniques and suggestions to make gentle or radical changes. Among the action agenda steps:

IN THE FAMILY

Problem	Action Agenda
Girls are, boys do stereotype	Read books and watch television with your children; help them to analyze the content
	Use the language of skill and success to complement girls; encourage caretaking in boys

IN THE SCHOOLS

75 percent of females in vocational education programs are in low-paying fields of health, home economics, clerical work, and cosmetology	Insure that girls are encouraged to participate in non-traditional vocational training
Girls aren't good at/interested in math or science stereotype	Studies show intervention can make a difference; the "math gene" is a myth, and girls will respond to encouragement. Work with school committees to develop a plan to register in math/science/computer and related courses

IN THE COMMUNITY

Underfunding of girl serving programs	Review and audit services for girls in your community. Work with women's organizations and political groups to strengthen and expand them
In 1984, United Ways gave $2.38 to boys' programs for every $1 to girls	Find out how many women are on your United Way board; join the board yourself and/or campaign for members who care about girls. Review United Way allocations for girls' and boys' programs: Are the dollar amounts equal? Are the populations served equal? Do the programs *serve*?

IN THE WORKPLACE

Corporate and foundation underfunding of girls' programs: in 1982, foundations gave 91 grants to girls totaling $2 million and 377 grants to boys totaling $13 million	Make sure females participate in decisions about corporate giving
	Strengthen schedule options, day care provisions, and parental leaves to deliver the message that workers, female and male, are equally important family members
Lack of awareness of career options among girls	In summer hiring, open non-traditional jobs to girls and boys alike

	Serve as mentors to girls and young women in your employ
	Address girls' needs through giving to and volunteering for community programs through your community relations department

IN THE NATION

Public monies used to purchase educational material and equipment (books, filmstrips, sports gear designed only for boys) that reinforce stereotypes for behavioral and attitudinal stereotypes	Write your representative in Washington in support of the Women's Educational Equity Act to combat stereotypes in education
High unemployment rates among female teenagers, especially minority teenagers	Support job development programs designed for female teenagers; let your Congresspeople know you want them to support equal access for girls to vocational and professional schools

"Society's expectations for the women of tomorrow translate into tall orders that today's girls cannot possibly fill if we continue to short-change them," says Ms. Gates. "Everyone can do something to remove or weaken the barriers to economic autonomy for girls. And each of us must start taking action if the future is to be different for today's girls."

Girls Clubs of America, which is celebrating its 40th birthday as a national, not-for-profit service and advocacy agency for girls aged 6-18, serves 200,000 girls through 240 Girls Club Centers and various outreach programs across the United States.

ECONOMIC LITERACY PAPERS

How are runaway shops and divorce shrinking membership in the middle class?

Why is the poverty rate rising?

What does the "feminization of poverty" really mean?

What economic policies are needed to bring women and children above the poverty line?

The *Economic Literacy Papers* are a new series analyzing pressing economic issues from a progressive feminist point of view. Each paper provides accessible analysis, up-to-date statistics, strategies for change, and resources for further reading. Produced in a convenient brochure format, the papers are perfect for use in conferences, workshops, or study groups - and, as they fit into a business envelope, are easily distributed by mail.

The papers are written by the Economic Literacy Project (ELP), a group of women economist-activists with five years of experience in providing economic literacy workshops for women's, peace, religious, and other community groups. The ELP is a program of Women for Economic Justice. WEJ is increasingly becoming a strong statewide, multi-racial, multi-class, women's organization committed to winning concrete economic victories, particularly for poor women and people of color.

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July-August, 1985

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