

Association for Women in Mathematics

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NEWSLETTER

January-February 1985

PRESIDENT'S REPORT

Changing of the Guard. As of January 1985, Linda Keen, Professor of Mathematics at Lehman College, CUNY, becomes president of AWM. It is a pleasure to leave this office to her very capable direction. Linda has been active in AWM since its inception in the early '70's. Last January she was the co-organizer, with Tilla Milnor, of the highly successful AWM panel in Louisville, Kentucky: Lipman Bers, A Mathematical Mentor. Good luck, Linda!

Anaheim Meeting. AWM has an interesting program planned in conjunction with the joint meetings of the American Mathematical Society-Mathematical Association of America in Anaheim, California, January 7-13, 1985. On Thursday, January 10 from 10:15 to 11:15 there will be a panel discussion on "Nonacademic Careers in Mathematics" with Patricia Kenschaft, Montclair State College, as organizer and moderator. Among the speakers will be Maria Klawe, IBM; Elizabeth Ralston, Inference Corporation; Bonnie Saunders, Star Consultants; and Margaret Waid, Sperry-Sun-Baroid. Following the panel will be the AWM Business Meeting. On Thursday night beginning at 5:45 AWM will host (it's become a neutral word) a cocktail party. On Friday January 11 at 9:00 a.m. the Emmy Noether Lecture will be delivered by Professor Jane Cronin Scanlon of Rutgers University and Courant Institute. In the evening there will be a dinner in her honor; the sign-up sheet for dinner will be at the AWM table. Throughout the meeting the AWM table is the place to come to meet friends, old and new, and find out more about AWM. Please also sign up to "man" the table.

Speakers Bureau. Judith Wason has resigned as director of the Speakers Bureau because of other pressing duties. We all want to thank her for the excellent job she has done in organizing and running the Bureau. In the interim Alice Schafer, former president of AWM, will be Acting Director. It's not too late to be a speaker even if you have not yet signed up. If you give a talk at a high school or college the Speakers Bureau will pay for part or all of your travel expenses. Just write to AWM, Box 178, Wellesley College, Wellesley, MA 02181 for a voucher form containing complete information.

Statistics of the Profession. The Annual AMS Survey in the November 1984 Notices provides fascinating reading. This year again women comprise 20% of the new Ph.D.'s who are U.S. citizens, up from 10% in the mid-70's. Again the total number of Ph.D.'s has declined slightly, as has the percentage of those who are U.S. citizens, continuing a trend over the past decade. The number of black and chicano Ph.D.'s in mathematics, a total of eight who are American citizens, continues to decline, and this year there are no women in that group. However, of the 25 new Ph.D.'s who are American citizens of Asian descent 10 are women.

More startling are the figures on salaries. Starting salaries have experienced a sudden rise, resulting in the curious fact that on the average new Ph.D.'s in both academia and industry have slightly higher salaries now than those with one year of experience. This is probably demoralizing to those who got their degrees in '82-'83, but it means that ultimately all salaries will rise. More demoralizing is the fact that new Ph.D.'s are making less money in research and teaching (on a nine-month basis) than new B.A.'s in mathematics are offered by industry. Even for twelve-month salaries, not always available in academia, the starting salary of the Ph.D. is only slightly more than that of the new B.A. in industry. All this looks grim now, but it is surely good for the future of our profession. If you are an academic, especially at a state college or university, bring these figures to the attention of your congressman and senator.

The figures also show that, on the whole, males continue to receive higher starting salaries than females. It's hard to be optimistic about a change here.

The AMS has been performing an invaluable service in collecting and disseminating these statistics for the information of the mathematical community, and deserves much credit for the excellent job it has done.

Goodbye. This is my last President's Report. I would like to take this opportunity to thank you all for your help and enthusiasm. Also I would like to thank AMS and the MAA for all the support they have given us.

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LETTER FROM THE EDITOR

Thanks to all of you who send me articles. Without your help, the Newsletter would be much thinner and much less interesting. But I would like to issue a plea: when you send me an article to reprint, please note the publication name, issue date, and page number on the copy. Also, the editor's name and address would be very helpful. However, if you don't have all this info, send the article anyway--Chicago is full of libraries!

PEER, the Project on Equal Education Rights of the NOW Legal Defense and Education Fund, has published the first in a series of computer equity reports. "Sex Bias at the Computer Terminal - How Schools Program Girls" is well-written and provocative. Copies are available for \$3 from PEER, 1413 K Street NW, 9th Floor, Washington, DC 20005. Bulk rates are available.

Here are a couple of excerpts:

The technological revolution is overtaking our schools. Pressured by demands from parents for educational programs to prepare their children for new jobs in the "information society," and lured by the potential to help teachers teach more effectively, school systems across the country have purchased hundreds of thousands of microcomputers in the past five years. In 1983 alone United States schools spent nearly \$500 million on computers and programs. Yet in the midst of this new and exciting technological change, an old familiar story is emerging. Richer schools are acquiring computers more rapidly than poorer schools, giving their students a distinct advantage in competing in the job market of the computer age. And boys are learning about and using computers more in the schools than girls. Once again, the schools are becoming a breeding ground for a pattern of opportunity based on sex, race and class rather

than on abilities. For the young women of tomorrow's "high tech" world, missed opportunities carry a potentially double threat--for them and for their children. For as women become a larger and larger share of the nation's poor, it is their children--male and female--who become the new "technopeasants" in an increasingly technological world.

Computer-assisted learning can help break through the negative atmosphere created by biased teacher attitudes--if the programs are written well. Good computer-assisted learning programs reinforce correct answers and point out incorrect ones equally, regardless of sex, race, national origin, or disability. Even after repeated errors, a well-written program draws no conclusion about the user's innate abilities. ...

The report noted that one of the advantages of the ... drill-and-practice programs ... was immediate feedback provided by the computer. Students frequently mentioned the relief of making mistakes in private; because their anxieties about failure diminished, students' capacity for learning increased. Teachers regularly cited students whose confidence and performance improved; as a result, their feelings about--and behavior towards--the students changed. If software developers could advance beyond crude, over-simplified and biased software, the computer could potentially help break an important and difficult element of sexism in education.

A newspaper article about Pat Kenschaft's entire family registering at the summer AMS/MAA meeting was picked up by the AP. Titles of resulting articles included "Family finds togetherness at math society conclave," "Family enjoys math as a hobby," and "Professor's family adds convention to vacation." These articles included ideas on how to introduce math topics into everyday family life.

Kenschaft reported in the March-April 1984 Newsletter about sending letters concerning AWM to local newspapers. One such letter has led to a couple of newspaper articles, both of which were illustrated and well-placed. Consider trying to generate similar publicity for AWM in your area.

Sweden's entry in the New York Film Festival this year was "A Hill on the Dark Side of the Moon." The movie is about the relationship between Sofia Kovalevskaja and Maksim Kovalevski (no relation). Also, another review of Koblitz's biography of Kovalevskaja, A Convergence of Lives, was written by Alex Kozlov, News Editor of SIAM News. It appears on p. 5 of the May 1984 issue of that publication.

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LETTER TO THE EDITOR

To the Editor:

Jean-Marie Silk's letter and the editor's reply indicate an inevitable problem in a country where less than half the mathematics teachers are certified, and certification indicates a bare minimum of mathematical knowledge. That the Montclair Public School system is generally regarded as one of the best in the country emphasizes the urgency of the letter. While going through this system my own children had seven mathematics teachers that I would rate between good and absolutely superb.

However, guiding my children through even this system often meant coaching them in tact. When my daughter's seventh-grade math teacher revealed himself as an outrageous sexist in the classroom, she urged me to act on my convictions and complain. "Be glad he knows some mathematics, Dear," I responded. "Most Americans your age are taught by people who don't know any math." However, when the man told a boy in the class that if he couldn't do problems any faster than that, he "should sit on the girls' side of the room," I knew I had to do something. Anonymously, I bought him a membership in AWM, and these newsletters descended upon him. His classroom behavior shaped up nicely, and he was becoming a really good teacher when he decided to quit and go make big money.

When Lori entered the classes of the high school department head, who took the most advanced students during their last three years for herself only, we had a different problem. This teacher was carefully and consciously non-sexist, but her ideas of what constitutes mathematical truth are remarkably different from mine. This time when my daughter told me to go complain, I warned her that we might win a battle and lose a war. She completed that one year "successfully", but afterward I refused to let my offspring take mathematics in that high school.

My son entered Carnegie-Mellon University this fall as a mathematics major having taken no mathematics in his last two years of high school. The university just sent us mid-semester grades (an anachronistic, but pleasant, custom) and he is running an "A" in Calculus 3. Apparently his mathematical preparation after a long mathematical hiatus is better than that of most Americans.

Until we have better-educated mathematics teachers, the movement to require high school students to take more mathematics scares me silly. I believe my son's experience indicates that no mathematics is better than wrong mathematics. When we have poorly prepared teachers, our students are taught anti-mathematics. Well-prepared teachers do not want to teach unmotivated students, especially if they have been taught anti-mathematics for several years before reaching the good teacher, so requiring unmotivated students to take more years of mathematics will drive our good teachers out of the classroom in even greater numbers than they are now leaving. Will correct mathematics die completely in our country after they are all driven away?

The New Jersey Chapter of AWM has been actively campaigning for a bill to provide scholarships for uncertified people teaching mathematics and other teachers about to be transferred into mathematics teaching as the demand for their own field diminishes. This would enable them to study at the state colleges, funded half by the state government and half by the town in which they teach. I have put a great deal of time into the effort to pass this bill. It is an undeniable fact that teachers who know mathematics, like my offspring's middle school teacher, are leaving the profession. Surely nobody can enjoy pretending to teach something they don't know. It seems to me that mathematics in our country is doomed unless those teaching it to the next generation have more preparation than a special weekend institute.

Pat Kenschaft, Montclair State College

SCANLON TO DELIVER NOETHER LECTURE

by Jeanne LaDuke, Associate Editor

The sixth annual Emmy Noether Lecture will be given by Professor Jane Cronin Scanlon at 9:00 a.m. on Friday, January 11, 1985 at the joint meetings in Anaheim. Professor Scanlon's title is "A model of a cardiac fiber: problems in singularly perturbed equations." Previous speakers in this AWM-sponsored lecture series have been Jessie MacWilliams, Olga Taussky-Todd, Julia Robinson, Cathleen Morawetz, and Mary Ellen Rudin.

Dr. Scanlon, Professor of Mathematics at Rutgers University, is spending the academic year 1984-85 at the Courant Institute under the NSF Visiting Professorships for Women Program. While there she is working in the area of mathematical models of electrically active cells - problems in singularly perturbed equations.

Professor Scanlon was born in New York City in 1922, lived in the New York area until she was fourteen, and after a few months in Washington, D.C., moved with her family to Michigan. She attended Highland Park Junior College from 1939 to 1941 and received a B.S. degree from Wayne State University in 1943. She received an M.A. from the University of Michigan in 1945 and a Ph.D. from Michigan in 1949 after having been an Office of Naval Research Fellow at Princeton in 1948-49. Her dissertation, "Branch points of solutions of equations in Banach space," was written under the direction of E.H. Rothe. She was a Horace H. Rockham Postdoctoral Fellow at Michigan in 1950-51.

She was employed as Mathematician at the U.S. Air Force Cambridge Research Center from 1951 to 1954 and as an instructor at Wheaton College in Massachusetts 1954-55. She worked part-time as a mathematician for the American Optical Company in 1956. She was on the faculty at Polytechnic Institute of Brooklyn from 1957-65. Since joining the Rutgers faculty in 1965 she has twice (1968-69, 1972-73) been a Rutgers Research Council Fellow. She has served as consultant for the General Precision Corporation (1963-66) and for the Naval Research Lab (1967-68). Professor Scanlon has four children.

Professor Scanlon summarizes her research areas as follows (in chronological order): application of topological methods (topological degree, fixed point theory) in solving abstract and concrete functional equations; topological and analytical methods for solving nonlinear ordinary and partial differential equations; and various problems in mathematical biology for which the mathematical models are nonlinear ordinary differential equations. She is a member of AMS, SIAM, the International Society for Chronobiology, and the Society of Mathematical Biology. She has served on the Editorial Boards of the Journal of Mathematical Analysis and Applications, Nonlinear Analysis, the AMS Surveys and Monographs Series, and Neurological Research.

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CATHLEEN MORAWETZ, FIRST WOMAN TO HEAD A MATHEMATICS INSTITUTE

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Thanks to Alice Schafer for bringing this article to our attention.

Cathleen Synge Morawetz, recently appointed Director of New York University's Courant Institute of Mathematical Sciences, is the first woman to head a mathematics institute in this country.

"I think my appointment is significant," says Morawetz, "mainly because it highlights how few women there are in mathematics."

Morawetz quickly adds, however, that "I am delighted to see that there are lots of young women coming up in mathematics. We have more women post-docs coming to Courant now than we have ever had before."

Improving prospects for women in mathematics, and in all the professions, have come about partly because of the ground-breaking experiences and efforts of women like Morawetz.

No Jobs

Somewhat ironically, several incidents of employment discrimination based on her sex contributed to Morawetz's decision to pursue a mathematics Ph.D.

After obtaining a master's degree in mathematics from the Massachusetts Institute of Technology in 1946, Morawetz did not intend to go straight into doctoral work. Instead, she moved to New York with her husband (chemist Herbert Morawetz) and looked for a job. However, when she approached Bell Laboratories and was told her name would be included in a pool of women applicants with bachelor degrees, Morawetz said, "Not interested."

Through a subsequent combination of circumstances, Morawetz found a job at New York University editing the book Supersonic Flow and Shock Waves, written by Richard Courant and Kurt Friedrichs. This experience stimulated Morawetz's interest in further research in the area, and she eventually wrote a Ph.D. thesis with Friedrichs on imploding shock waves.

Continued frustration in finding suitable employment was the most discouraging aspect of Morawetz's early career. "I tried to go into industry, and I didn't get anywhere," she explains. "Some companies had a very discriminatory policy. I was certainly offered jobs, but they were far below what I would have got had I been a man. It was kind of offensive."

After receiving her Ph.D. Morawetz spent several years at New York University doing part-time work that was funded by navy contracts. Finally, she was offered an assistant professorship in 1958 and has been at NYU ever since.

Scattering of Waves

Morawetz's career research interests have focused on the mathematics of transonic flow and the scattering of waves, with the latter area dominating her attention in recent years.

"A while ago, I started doing some computational work with Greg Kriegsmann (Northwestern University) and Alvin Bayliss (Exxon Research)," explains Morawetz. "The object was to compute diffraction patterns when the situation could not be accurately described by geometrical optics, on the one hand, which is the limit of zero wavelength, nor could it be adequately described by a perturbation theory for a long wave-length. So we made a number of numerical experiments using some energy identities I had developed in my earlier work."

Morawetz has also become interested in inverse problems. "You want to be able to find out more about what the scattered field is being scattered from," she said. "The point is to learn the shape if it is an object or the distribution of values if it is a variable index of refraction. These are very hard problems which have been around a very long time, and there is a lot of interest in them now. While one-dimensional problems are pretty much understood, no one can really do anything with higher dimensions."

Pioneer Role

Morawetz's appointment as the first woman to head a mathematics institute highlights a career as something of a pioneer. Not only did Morawetz enter a field that at the time was dominated by men, she was determined, long before it was considered acceptable, to combine a career and a family. ("I have three daughters, one son - all professionals - and two grandchildren.")

Although her father (applied mathematician John L. Synge) obviously played a role in developing her interest in the subject, there was a lack of supportive role models. "I knew one woman mathematician, Professor Cecilia Krieger, in Toronto, and she was certainly very encouraging," said Morawetz. "But she wasn't married and she had no children, and I didn't see that as an ideal life."

"Later I met Mildred Cohn, now a very distinguished chemist and a very strong professional, who also had several children. I got some tips from her on how to manage."

Feels Lucky

Morawetz considers herself fortunate because she studied at New York University. "One of the things that made me go on into mathematics," she says, "was the free exchange of ideas and the generally relaxed atmosphere at Courant. In many places that wasn't true, and it was particularly hard for women."

Morawetz believes that the increasing encouragement of openness and interaction within university departments has been a major positive change for women in mathematics. "Women nowadays have a more supportive atmosphere," she says.

Despite these improvements, Morawetz feels that women who want to combine a mathematics career with a family still face great pressures. "Since an academic's time is often unstructured," she says, "there is a great temptation to try to juggle too many responsibilities. (Laughs) But then I should talk."

AWARDS AND HONORS

Two women have been appointed to directorships of the National Science Foundation. Judith S. Sunley has appointed Deputy Division Director and Elizabeth M. Martin, Program Director, both in the Division of Precollege Education in Science and Mathematics.

from AMS Notices, Oct. 1984:

The Conference Board of the Mathematical Sciences has announced the appointment of T. Christine Stevens of Arkansas State University as the AMS-MAA-SIAM Congressional Science Fellow for 1984-85. Under the terms of the fellowship, she will spend one year in Washington, D.C. as a special legislative

assistant on the staff of a member of the U.S. Congress or a congressional committee.

She holds a B.A. degree in mathematics from Smith College and M.A. and Ph.D. degrees in mathematics from Harvard University. She has been a member of the Department of Computer Science, Mathematics, and Physics at Arkansas State University since 1981. Her research interests lie both in topological groups and semigroups, and in the history of mathematics, especially the development of calculus and the origin of the theory of transformation groups. During 1982-83, she took a leave of absence from Arkansas State to pursue these interests as a Visiting Scholar at the University of Cambridge, England. National issues of particular concern to Stevens are the national shortage of science and mathematics teachers, funding of pure and applied research, and the technical aspects of arms control. Stevens is the sixth Fellow to serve in the AMS-MAA-SIAM program since it was established in 1978.

The following women mathematics teachers were selected by their states to be finalists in the 1984 Presidential Awards for Excellence in Science and Mathematics Teaching program. One mathematics teacher from each state will be chosen for Presidential awards. The winning teachers also earn a \$5,000 National Science Foundation Grant to be used for improving the mathematics program at their schools and will attend a workshop at the National Academy of Science. The Presidential Awards program was started in 1983 to honor outstanding science and mathematics teachers who could serve as models for others and to encourage good teachers to enter and remain in the field.

The finalists, listed by state, are: Alabama: Sandra Hunter Hampel, Wanda M. Motes; Arizona: Sherry Baca; Arkansas: Patricia Havlin, Linda F. Shibley; California: Joan M. Gell; Colorado: Christine J. Comins, Linda M. Giauque; Delaware: Shirley P. Miller; District of Columbia: Ethel Cobb Henderson, Karen H. Wingfield; Florida: Marita H. Eng, Barbara E. Nunn; Georgia: Pamela Johnson Drummond; Hawaii: Reverie N. Suzuki, June J. M. Yamashita; Idaho: Elisabeth B. Linney; Illinois: Cathy J. Cook; Indiana: Martha E. Hegg; Iowa: Karen A. Dotseth; Kansas: Beverley W. Nichols; Louisiana: Barbara I. Stott; Maryland: Elaine L. Wiza; Massachusetts: Anne Elliott Smith; Michigan: Rheta N. Rubenstein; Minnesota: Judith K. Halvorson; Mississippi: Mary Kathryn McMullan Sims; Nebraska: Ann Aksamit; Nevada: Jennifer Jo Salls; New Jersey: Jane B. Kennedy; New York: Judith Broadwin; Ohio: Marilyn Cross; Oklahoma: Anne Auxier; Puerto Rico: Carmen M. Nazario de Perez, Luz P. Gonzalez Rivera; Rhode Island: Sue Himelick Fisher, Janice A. McGoldrick; South Carolina: Alexia B. Latimer; South Dakota: Rochelle VonEye; Tennessee: Mary Emma Bunch, Polly Anna Philips Harris; Texas: Marjorie Valentine; Utah: Jolene M. Morris; Vermont: M. Marklyn Trainor; Virginia: Barbara Day Bass, Janice K. Mort; West Virginia: Joan M. Mofsinger, Dorothy Dale Williamson; Wisconsin: Gail F. Burrill; Wyoming: Judy Adams.

NSF news release

The National Science Foundation has announced twenty-nine awards designed to help make full use of the Nation's scientific and technical resources by encouraging women to develop careers in science and engineering research.

The awards, called Visiting Professorships for Women, will enable experienced women scientists and engineers to participate in the research and teaching programs of a host institution. The visiting professors will also serve as advisors and counselors to students and provide encouragement to other women to pursue careers in science. Among the recipients are nine mathematical scientists. These scientists, their home institutions, fields of study and the institutions they will attend are as follows:

Sun-Yung Alice Chang (University of California, Los Angeles), Applications of modern real analysis methods, California Institute of Technology; Graciela Chichilnsky (Columbia University), Topology and its applications to economic equilibrium, game theory and social choice, University of California, Berkeley; Patricia J. Eberlein (State University of New York, Buffalo), Norm-reducing methods

for algebraic eigenproblems for parallel and micro computation, Cornell University; Julia F. Knight (University of Notre Dame), Recursion theoretic problems in model theory, University of Illinois, Urbana-Champaign; Diane Lambert (Carnegie-Mellon University), Nonparametric mixtures of logistic regression models, University of Chicago; Jane Cronin Scanlon (Rutgers University), Mathematical models of electrically active cells: Problems in singularly perturbed equations, Courant Institute of Mathematical Sciences, New York University; Maria E. Schonbek (Duke University), Nonlinear dispersive and diffusive equations, Princeton University; Nell Sedransk (State University of New York, Albany), Statistical Theory for combining experiments and implications for experimental design, Yale University; and Susan Szczepanski (Lehigh University), Topology of singularities, Courant Institute of Mathematical Sciences, New York University.

Two of eight high school teachers recently honored for excellence in teaching mathematics are Susan Gardenhire, Albuquerque, New Mexico, and Beverly Shumway, Anchorage, Alaska. An awards luncheon was held at the SIAM (Society for Industrial and Applied Mathematics) National Meeting held in Seattle, Washington, July 16-20, 1984. The teachers were selected by the state affiliates of the National Council for Teachers of Mathematics.

INSTITUTE FOR RETRAINING IN COMPUTER SCIENCE (IFRICS)

preliminary announcement

Ed. note: see Newsletter, Vol. 13, No. 6, pp. 8-9 for reactions of one participant.

The IFRICS program is under the auspices of the Joint ACM/MAA Committee on Retraining for Computer Science. The program, which began during the summer of 1983 under the direction of Ed Dubinsky at Clarkson University in Potsdam, New York, was established as a response to the critical and growing shortage of college teachers of Computer Science. The program is designed to retrain faculty from other fields such as mathematics. The training takes place during two consecutive summers. During the intervening academic year, each participant is expected to teach a computer science course at their home institution and to complete a major programming project. The program prepares the participants to teach about half of the ACM '78 core curriculum in computer science. As they gain teaching and programming experience, participants are expected to be able to teach most of the undergraduate courses in computer science. The faculty, which is drawn from top institutions, consists of established computer scientists with solid research records who are outstanding teachers.

Beginning with the summer of 1985 a second campus of the Institute will be established at Kent State University, Kent, Ohio. This extension will be guided by the same principles and the standards of quality which have been demonstrated during the first two years of the program at Clarkson University.

The dates are: Clarkson University, June 3, 1985 - August 2, 1985 and Kent State University, June 17, 1985 - August 16, 1985. Interested candidates should write for more information and application forms to:

Ed Dubinsky, Director
Department of Mathematics and Computer Science
Clarkson University
Potsdam, NY 13676 Phone: (315)268-2382

or

Darrell Turnidge, Director
Department of Mathematical Sciences
Kent State University
Kent, OH 44242 Phone: (216)672-2077.

PAM SURKO'S TALK AT THE WOMEN SCIENTISTS' LUNCH AT AAAS IN MAY

by Pam Surko, Ph.D., President of AWIS (Association for Women in Science)
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The day before yesterday, a writer for Ladies Home Journal called me up and said she's doing an article on Women Leaders in Science. She posed a thought-provoking question to me: "I just talked to Betty Vetter, at the Academy, and from the data she gave me, it seems to me that women aren't making it in science. Is that true?" I told her that I think she's right. Women are not making it in science, in the way they should. Some aspects of trying to have a productive scientific career have gotten better in the last decade, but there are still barriers at every step of the way. And career advancement is a real problem.

It used to be easy to cop out and say "The problem is the pool." That used to be one of the problems, but it never was the only one. Today, it isn't the most important barrier in many fields.

It's obvious that barriers exist at all career levels. Women are not promoted at the same rate as men. Betty Vetter's statistics show this clearly. Women make less money than men, they're less likely to be managers than men, they're less likely to enjoy autonomy than men--autonomy coming from the freedom to pick your own problems, work in a well-equipped lab, in a way that maximizes your efficiency.

Why are the barriers there? A sociologist friend of mine once told me how disgusted she was after a meeting with a University president, who was a distinguished economist. "He can't understand that an institution 98% white males, even though they're not intending discrimination, can be sexist. Where's his mind? That's an obvious - a given - that every one of my Sociology 101 students understands." An institution with a history, a tradition, can be sexist, even if its individual members are well-meaning.

"Well-meaning" individuals can be sexist. Practically no one would disagree with the statement "Women should have the same opportunities as men", and yet we see discriminatory behavior from people who probably are not intending to be hurtful. They grew up with a certain set of biases--we all grew up with biases. There's nothing we can do now to change our childhood. But these people have spent no intellectual energy on examining the problem of sexism. They just haven't thought deeply about it. It's intellectual sloppiness. It's hard work to break habits. It's hard work to discover your own biases and work them out. They haven't been willing to put in the energy.

I have a lovely example of this sort of intellectual sloppiness. I shouldn't say "lovely," because actually it's very harmful to a large number of women--engineers--who are laboring in especially tough circumstances. I'm going to read you a quote from a report from the President of the National Academy of Engineering, Robert M. White, to the National Science Foundation. This report dealt with how the Foundation should strengthen its engineering efforts. In discussing the topic, Mr. White discussed two aspects of engineering in the US, engineering education, and engineering research, which could come under the purview of NSF. Here's the entire section on Women and Minorities in Engineering:

"...We believe that greater attention is required to the role of women and minorities in engineering. The engineering profession in recent years has seen a dramatic increase in the number of women and minority engineers. The trend is commendable and can help to mitigate the effects of the coming decreases in enrollment in high school and college. Explicit effort to increase the number of women graduate students in engineering, particularly with respect to teaching careers where the need is acute, represents a promising new way to address a serious current problem. Two-year fellowships for women might be introduced at the entry level to graduate school. There is an increasing supply of women at the undergraduate level, and support at the entry level would have a major impact on

increasing the number of women graduate students in engineering, particularly US citizens."

He has not confronted his bias that women aren't suited for "real" engineering. He feels that they could be trained to relieve men from the low-paying teaching jobs so that the men can go out and make "real" contributions and make the big bucks. This would be an easier solution than making the teaching jobs more attractive to all engineers by raising the salaries or by thinking up creative new programs.

This is the president of the National Academy of Engineering speaking. Their charter is "to recognize distinguished engineers, to examine questions of science and technology at the request of the federal government, to sponsor engineering programs aimed at meeting national needs, and to encourage engineering research." His intellectual laziness is going to cost a lot of women who want to do engineering, and who want to be not only good engineers, but great engineers.

A third reason that barriers exist is that there are still plenty of people out there Mary Rowe calls "dinosaurs". Openly sexist, unwilling to change. Not educable. A thinning species, thank goodness, but not extinct.

What can we do about these barriers?

First of all, let me state that the victims should not have to be responsible for generating the solutions. But let's be pragmatic: who is most likely to think deeply about the problems, and generate creative solutions? And, at least in my own life, I've found that where a problem exists, I have to either be on the defensive, or on the offensive. And it's much healthier for me to be on the offensive.

We can push for programs to give women boosts at every stage of their careers, to help overcome the barriers due to isolation, fewer collaboration opportunities, lower or non-existent salaries. One example of a program like this is the Visiting Professorships for Women program of the NSF. It gives women an opportunity to take a year away from their own environment in another of their choosing, to foster new research collaborations, give their research career a bit of a boost, and benefit the host institution by having another woman role model as a guest.

One effective way to push for good programs to help women overcome the barriers is one you've already found because you're here today: support organizations like AWIS, GWIS, and SWE.

We can take advantage of whatever opportunities like this come along, without feeling the least bit sheepish that they may be available only to women. The barriers are available only to women, and we don't have a choice there. With luck, we might break even.

We can make good use of the fact that most people are well-meaning about sexism, even if not well-educated about it. We can push our corporation presidents and our University chancellors to foster an atmosphere within the institution where sexist behavior is scorned, and not tolerated. There's an old saying that you can't legislate morality. But you can legislate behavior, and language. And I think the linguists and psychologists will tell us that patterns of action and patterns of speech are very powerful in shaping attitude. I'm lucky to work in an institution, Bell Labs, where strictures against any overt sexist behavior came down from above, long ago. And it's made a great improvement.

To help our own careers, besides doing the best, most thoughtful science we can, we can keep the 80's buzzword "networking" in our minds. That means, not hesitating to ask for and give favors, not to be afraid to do PR for our own work. Some years ago now, a friend of mine met our boss at the coffee pot one morning, as I walked up, and I heard him telling him "I had a great idea this morning!" I could never have said a thing like that--I still would have trouble saying it. And I have had some mornings with great ideas. I've got to learn to be able to say that.

Networking also means finding a mentor--which most likely will be a man. Mary Rowe has written well on what a mentoring relationship should be, and how it can benefit both the mentor and mentee. As we continue to learn how to cope in our environment, we can pass on what we've learned by being mentors, in turn.

We can also think carefully, and put energy into teaching our colleagues about their own biases. It's a delicate balance, being tactful enough so you don't alienate them and close the learning channel, and pushing hard enough so you do some good.

One pragmatic thing I suggest to young colleagues, although it's taking on a burden which isn't fair, is to minimize unimportant differences. Give up whatever ways make you different from your colleagues which don't cost you too much. I don't care much about clothes, so I dress conservatively. I think it probably helps me if on first meeting a colleague thinks subconsciously "She doesn't look flaky." If I cared a lot about wearing a particular kind of clothes, perhaps that'd be too high a price for me to pay.

I also caution my young colleagues about getting into an atypical professional situation. If your skin is a different color or shape from the average, that may be all the difference you can afford in your institution. Stay away from fields of work which cross department lines, so that it can't be easily evaluated by the people who are in the positions of power with respect to your future. If you want to begin a new interdisciplinary field, wait until after you get tenure.

Also, "special" positions, usually labelled "adjunct" or "visiting" or "guest", are almost always death of a real career in the institution. It is usually better in the long run to go somewhere else where you can be a "vanilla-flavored" tenure-track researcher, than to stay in one of these no-power, no-prestige jobs. The usual line is "You'll never have a better opportunity to learn X,Y,Z." That may be true, but you need to weigh that against the fact that you'll also not have the opportunity to learn how to supervise staff, grub for grants, interact well in faculty push-and-shove meetings, and so on.

These few little suggestions about climbing over barriers aren't going to change the world. I don't expect that there'll be a year when I'm made VP of Bell Labs, and have a woman boss. But we are making progress! If we can all stay focussed on knocking down the barriers that exist throughout our scientific careers, we will have an ever-easier time, and so will our younger sisters. Doing science is a joy, and we're getting freer to enjoy it all the time!

BILLION DOLLAR SCIENCE BILL SIGNED

by Alex Kozlov, SIAM News, Vol. 18, No. 5, Sept. 1984, p. 1
reprinted by permission of the author and the Society for Industrial and Applied Mathematics, 1405 Architects Building, 117 S. 17th St., Philadelphia, PA 19103
Thanks to J.M. Silk for bringing this article to our attention.
Ed. note: This bill is an authorization bill, not an appropriations bill. I do not know if Congress has put any money where its mouth is.

Ronald Reagan signed a bill on August 11 authorizing the spending of nearly \$1 billion over the next two years to improve mathematics and science education.

The Education for Economic Security Act "is designed to recruit, retrain, and retain personnel in mathematics education at all levels," says Richard Long (Government Affairs Specialist, National Council of Teachers of Mathematics). The act, says Long, will "give assistance to institutions of higher education to upgrade their instruction, and to give money to state and local education agencies to provide inservice teacher education, and to do long-range planning in mathematics and science education."

One of four major sections of the bill authorizes \$350 million for FY84 and \$400 million for FY85 for state and local educational agencies. For FY84, states are to receive \$220.5 million for elementary and secondary programs, and \$94.5 million for higher education programs. This part of the legislation is "formula-funded," which means that the amount of money each state will receive is based on the number of children aged 5-17 in that state's population.

NSF Programs

The bill also authorizes \$100 million for various NSF mathematics and science education programs. These programs are to include establishing and operating local teacher training institutes, developing teacher training materials and curricular materials, and providing graduate fellowships.

Another section of the bill provides \$30 million in FY84 and \$60 million in FY85 to the NSF to "encourage partnerships in education between the business community, institutions of higher education, and elementary and secondary schools," according to the bill.

Supply and Demand Cited

Specifically, under the "partnership" provision, the NSF is to establish an Engineering and Science Personnel Fund, which will be used to recruit and retain new engineering faculty; develop faculty instruction and instrumentation at two-year colleges; develop instructional instrumentation programs for postsecondary technical, engineering, and scientific education, with special emphasis on computer accessibility; promote programs for pre-college mathematics and science education and exchange of resources and personnel with industry; and develop college faculty in high technology fields.

The act states that in administering the partnership program, the NSF "shall take into account the current status and predictions of supply and demand for trained personnel in each discipline or specialty." The NSF funds are to be matched by funds from the private or public sector.

Merit Scholarships

The fourth major funding section of the bill, the "Congressional Merit Scholarship Program," authorizes the NSF to distribute \$5 million in FY84 and \$15 million in FY85 in scholarships to college students who plan to pursue a career in teaching in the fields of mathematics, science, or engineering.

The scholarship program will provide each recipient with \$5,000 each academic year, beginning with the third year of undergraduate study.

Senate Amendment

While the bill was originally introduced in the House of Representatives in March 1983, the final version is a Senate-sponsored measure. Congressional passage was delayed by a controversial rider, the "equal access" clause, which will permit school groups to use public school facilities for religious activities.

Although the Reagan Administration has generally favored increases in funding for science education, some analysts believe that were it not for the equal access clause, President Reagan may have vetoed the bill on the grounds that the spending levels involved were too high. Given Reagan's support of school prayer, however, these analysts said that the equal access clause virtually assured his approval of the legislation.

WOMEN AND MATHEMATICS: BALANCING THE EQUATION

For readers concerned about the issue of women's participation in mathematics, the book Women and Mathematics: Balancing the Equation draws upon a closely related group of recent research studies to discuss what is actually known about the nature and scope of the problem and what has been achieved in understanding its causes. An introductory chapter integrates the facts available on women and mathematics, emphasizing nationally representative data, trends over time, and the relation to women's participation in advanced education in general. Other chapters report research studies that focus on factors affecting the decision to enroll in mathematics courses during the critical adolescent years. A synthesis chapter draws conclusions about what has been learned from these studies, provides a

discussion of design and methodological issues, and identifies questions that remain open for future research. The research findings are also significant for those interested in the more general problem of low rates of participation in mathematical education in the U.S. Finally, a speculative chapter by an experienced evaluator of intervention programs for women discusses what this research suggests about the design of effective interventions.

The book is edited by Susan F. Chipman, Lorelei R. Brush, and Donna M. Wilson, all of the National Institute of Education. To order, write Lawrence Erlbaum Associates, Inc., Publishers, Suite 102, 365 Broadway, Hillsdale, NJ 07642.

RECOMMENDATIONS FROM THE CONFERENCE NEW DIRECTIONS IN TWO-YEAR COLLEGE MATHEMATICS

Twenty-four leaders in American education met at Menlo College in Atherton, California, in July of 1984 in order to discuss the state of mathematics in two-year colleges. At the conference, sponsored by the Alfred P. Sloan Foundation, twenty-two papers were presented and discussed. The main topics addressed by conference participants included the following: a case for curriculum change, technical mathematics, the influence of new technologies on the learning of mathematics, faculty renewal, and collaboration with secondary schools, colleges, and universities.

The proceedings of the meeting, New Directions in Two-year Mathematics, will be published by Springer-Verlag.

The chairman of the conference was Donald J. Albers, Second Vice-President of the MAA. He says, "Two-year colleges enroll nearly one-half of all college freshmen and account for more than one-third of all undergraduate enrollments in mathematics. It is astounding to me that only one of the many recent reports on the state of mathematics and science education in this country has gone so far as to mention two-year colleges."

The curriculum and the new technologies

Mathematics courses in two-year colleges should be of immediate use to students and not be seen merely as preparation for distant goals. The material should be connected to real life. Those parts of the subject of broadest usefulness in problem solving should be emphasized.

Computers and other elements of information technology are changing in fundamental ways both the mathematics that it is important to learn (such as discrete mathematics, statistics, and technical mathematics) and the ways that mathematics, traditional and otherwise, can be learned. This will have profound and continuing implications for students, faculty, and the curriculum.

Successful integration of information technology into the curriculum requires immediate access to computers; thus all mathematics faculty must be provided by their institutions with appropriate computer equipment and support and with training opportunities in information technology and related mathematical subjects.

- * Statistical literacy should be a fundamental goal of schooling. Basic mathematics courses should contain elementary statistical ideas and must prepare students for statistics as well as for calculus. Mathematics faculty should be trained in statistics.

- * Geometric concepts, including the use of computer graphics, should be integrated into entry-level courses wherever appropriate.

- * Entry-level courses for students who lack arithmetic skills should be organized around mathematical content new to these students (for example, vocational mathematics) and should utilize approaches different from what they may have experienced in school mathematics (for example, an approach emphasizing problem solving with calculators).

* Liberal arts mathematics (mathematics appreciation) is an important course and should integrate basic mathematical competencies including new technologies. These courses should be organized around the great ideas of mathematics and should offer a variety of topics for choice by instructors. Included in this choice should be topics from statistics, computing, and discrete mathematics.

* New mathematics curricula and approaches based on information technology (for example, spreadsheets, databases, and computer graphics) should be developed to serve the special vocational/technical and functional needs of the diverse two-year college student population.

* Planning should begin immediately to deal with the impact of symbolic manipulation software, graphics-based software, and the algorithmic point of view on the content of all mathematics courses.

* Two-year colleges must be prepared to meet the need of entering students having a wide range of prior experience with computers.

Collaborative efforts

Two-year colleges enroll nearly one half of all college freshmen and share common concerns about mathematics students with secondary schools, colleges, and universities. The success of our students will be enhanced by collaboration including the following general activities: development of policies and methods for cooperation by the principal mathematics organizations concerned with teaching at these levels (American Mathematical Association of Two-year Colleges, Mathematical Association of America, National Council of Teachers of Mathematics); joint efforts by state and local mathematics organizations and institutions; personal initiatives on a professional and social basis by individual faculty at all levels to promote a coherent and appropriate mathematics curriculum.

* It is imperative to reduce the need for remediation in the colleges. Two-year colleges along with other post-secondary institutions must work together with high schools to this end.

* Two-year college faculty in mathematics and in vocational/technical areas should meet within their own institutions and at regional levels to form better working relationships and to improve the quality of mathematics courses for vocational/technical students.

* Training programs should be instituted for mathematics faculty in order to increase skills in teaching technical mathematics. These programs will require collaboration and support by the private sector, two-year colleges, foundations, and professional organizations.

* High schools, four-year colleges and universities, and two-year colleges should establish faculty exchange programs for mutual benefit.

Faculty development and renewal

Faculty development and renewal are essential in maintaining the vigor of instruction and the quality of the curriculum. Faculty must commit themselves to continued and on-going professional growth and development. Thus, the educational community, industry, government, and foundations should provide adequate funding to ensure continued and frequent opportunities for faculty development. Professional organizations should provide a variety of activities and assistance for faculty growth. College administrators should encourage, support, acknowledge, and reward renewal efforts by faculty.

* Faculty must foster their own continued growth. Two-year colleges should view these efforts of faculty as essential and support them financially. Such growth activities include regularly teaching a variety of courses, reading, writing papers, participating in seminars and in

professional organizations, and learning new material through workshops and courses.

* Two-year colleges and their supporting bodies should view employment compensation and status more flexibly in order to encourage and reward professional excellence.

* The private sector and two-year colleges should facilitate faculty participation in industry, including short-term work experiences, as a valuable form of development.

* Universities should provide graduate programs appropriate for two-year college mathematics faculty.

ARE THE RUSSIANS AHEAD IN MATH ED?

by Claudia Zaslavsky, New York, NY

reprinted from N. Y. State Mathematics Teachers' Journal 34, 2 (1984), pp. 89-92

The author shares her first-hand experiences and impressions of mathematics education in the Soviet Union after a recent visit to Moscow, Minsk, and Leningrad.

In 1957 the launching of the Soviet spacecraft Sputnik gave impetus to the introduction of "New Math" in the United States. Ironically, it was not until 1967, ten years later, that the Soviet Union adopted a modern mathematics program, with implementation continuing until 1976 (Maslova & Markushevitz, 1969).

Recently I had the opportunity to acquire first-hand knowledge about the Soviet educational system, and about the mathematics program in particular. On December 9, 1983, I joined 23 other participants in a two-week tour of Moscow, Minsk, and Leningrad, organized by Citizen Exchange Council. We came from all parts of the United States, and represented all levels of teaching, from elementary through university.

We visited a variety of schools, including combined primary-secondary schools (the usual arrangement) that specialize in mathematics or in English language instruction. We met with the director of the mathematics program and other personnel of the Academy of Pedagogical Sciences, with teachers and principals, with textbook publishers, and with the Friendship Societies in the various cities. In the schools, we visited classes of our choice in small groups.

Ten years of schooling is compulsory, starting at age seven. The required curriculum is identical throughout the country, and is taught in 52 languages. Classes meet six days a week. National exams are administered after the eighth and tenth forms (grades). Starting in form four, when they are ten years old, children have different teachers for each subject. They may join after-school clubs for enrichment in various areas, and take elective subjects in forms seven through ten. Children entering the first form are expected to be able to read and work with numbers, having been taught in pre-school or in the experimental grade zero, or by their parents under the guidance of primary teachers. Six periods per week are required in mathematics in forms one through eight, and five periods in forms nine and ten.

The Soviets, like their counterparts in the United States, have found that parts of the mathematics curriculum are too difficult for the average student. Criticisms include: too high a level of abstraction, inclusion of unnecessary topics, few applications, and insufficient emphasis on the development of skills. For the past three years they have been testing several types of experimental textbooks in various schools and districts. These texts differ in methodology, but not in content, which remains substantially the same as in the previous modern mathematics program (Keitel 1982; Szekely 1983). Everyone is still required to study calculus! Testing of materials will continue for three more years, taking into account the opinions of educational psychologists, teachers, students, and

parents. These mathematics textbooks will then be published in 52 languages for use throughout the USSR.

School #36, in Minsk, features a mathematics specialization. There are many such schools in the Soviet Union, more than 60 in Moscow alone. The director and her two assistants are all female, as are 60 out of the 80 teachers in this school for 1500 children. All students take the required mathematics program in grades one through ten. This includes, in forms nine and ten: limits, the derivative and the integral applied to polynomial, trigonometric, exponential, and logarithmic functions; a vector approach to the geometry of the plane and of space, and solids of revolution. In addition to these requirements, they study such topics as differential equations and computer programming, and attend extra-curricular mathematics clubs.

In a third form class the children seemed to be engaged every moment. Frequent changes of activity demanded their constant attention--textbook problems, mental arithmetic exercises, board work and notebook work (always in ink), and a great deal of discussion. I observed similar classroom management in other primary classes in this school and in the English specialization schools in Minsk and Leningrad.

An example of a mental arithmetic exercise is: $700 - (540 \div 6 + 110) \times 2 = ?$ Children wrote answers in their notebooks; then several students explained their procedures step-by-step, while the others checked their answers.

An example of a textbook problem is: Given two of the quantities involving width, length, and area of a rectangle, find the third quantity. The class discussed methods of solution, then students worked in their notebooks, using rulers to draw the diagrams. Meanwhile the teacher circulated, discreetly handing visual aid cards to several students whom she had identified as needing help. Discussion of the solutions followed.

Another textbook problem presented to the children is: Two runners, 100 meters apart, race towards each other and meet in 10 seconds. One runs at the rate of 4m/sec. Find the rate of the other runner. After the class had discussed the problem, questions were asked: What do we know? What must we find? Do we have enough information? The teacher displayed a labeled diagram by opaque projector. The children wrote the steps in their notebooks, while one girl wrote her solution on the back of a folding chalkboard, so that other students could not see her work until they had finished.

After 20 minutes of intense activity, the teacher called a halt and put on a recording of lively music and songs, while a student up front led the class in exercises and singing; then the class was ready for another 20 minutes of mathematics. This procedure is followed in all primary (forms one to three) classes.

To complete the day, we were treated to a performance of folk and ballroom dancing by several groups of students. I had hardly expected to hear rock'n'roll with English lyrics in a Minsk school, but there it was!

In a Leningrad school with English specialization, seven-year-olds in form one were solving the following equations, explaining all steps in the process of solution: $x + 2 = 8$; $6 - x = 2$; $x - 5 = 3$. Later they volunteered to make up stories, some quite dramatic, to illustrate the relationship: $9 - 4$.

In Moscow we visited the physics and mathematics (physmat) boarding school associated with Moscow State University, one of 15 such schools in the country. Here 360 students from a large area surrounding Moscow, but not from the city itself, are admitted to either form nine or form ten, to receive intensive grounding in their chosen subjects, in addition to covering the required curriculum. Admission depends on their achievement in mathematics and physics Olympiads, and on the results of stiff written and oral exams, for which they receive three weeks of coaching in a summer session. Thirty mathematics instructors serve the school, nine of whom are on the permanent faculty, and the rest are visiting professors from the University.

Mindful of the discrepancy between male and female enrollment in mathematics courses in the United States, we asked about the situation in this physmat school.

"I was waiting for that question," laughed the director. "It is not good; we have only 60 girls." He hastened to add that in the Moscow special mathematics schools for day students, the enrollment was approximately equal, and the entering class in the physics faculty of the Moscow State University was 55% female. Moreover, the first prize in the recent twentieth anniversary celebration of physmat had gone to a girl.

Many of the problems of our educational system exist also in the Soviet Union. Regular classes are large (30-40), it is not easy to fill all teaching positions, teachers disagree on the role of calculators and computers in the schools, and, indeed, we encountered opposition to the great amount of time allotted to mathematics and science. A secondary school principal declared: "We must raise children to be good people, people with feelings and with concern for others. Children can learn these things from literature and social studies, but not from mathematics or science. I hope that with the reforms, we will devote more time to the humanities and less time to mathematics and science."

American educators frequently criticize what they consider excessive regimentation in the USSR. Soviet teachers are expected to follow detailed syllabi fairly closely, and to use the recommended methodology, with little leeway for the kind of innovation that some American teachers introduce in their classrooms. On the whole, concludes Thomas Romberg, Soviet children come out ahead. Based on his first-hand experience with many American classrooms, he states: "...it is agonizingly plain that the teaching of mathematics by many elementary school teachers in the U.S. is awful... The Soviet experience has led me to question our tradition of allowing teachers wide latitude in instructional decision making. When latitude leads to license to be incompetent, can we afford it?" (Romberg 1979, p. 93).

In some respects Soviet educators are better off than their American counterparts. Although teachers are not paid as well as industrial workers, they are held in high esteem. They have high expectations for their students, and are generally backed up by the society. Although television offers some competition to homework, there is no violence in TV programs. Neither are drugs or discipline serious problems. Students are motivated by the knowledge that everyone has a job after graduation; in fact, there is a shortage of skilled workers.

In every encounter with Soviet people, whether in arranged meetings or chance encounters on the street or subway, we heard expressions of their desire to live in peace with the American people. Our group agreed that more such exchanges are necessary in this period of international tension.

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STUDY TOUR OF THE SOVIET UNION

Counterpart Tours and St. Francis College are sponsoring a two-week tour of the Soviet Union scheduled to leave New York on 29 March 1985 and return on 14 April 1985. It will provide an opportunity to meet Soviet mathematics educators and visit classes in session. Participants will learn about the new Soviet school mathematics curriculum. Estimated cost (based on double occupancy) from New York is \$1400. This includes air transportation from Kennedy Airport, land and air

transportation in the Soviet Union, English-speaking Soviet guides, guided tours, visits to schools and meetings with public officials and members of the Scientific and Educational Workers' Trade Union, 3 meals per day, comfortable hotel accommodations, 3 cities--Moscow, Baku, and Kiev--, museum visits and many cultural activities. An option to earn three credits from St. Francis College, Brooklyn, NY is available. For further information contact Frances R. Curcio, Chairman, Department of Education, St. Francis College, Brooklyn, NY 11201 (phone: 718-522-2300, ext. 282) or Counterpart Tours, 250 West 57th Street, Suite 1428, New York, NY 10107 (phone: 212-245-7501; outside New York State, 800-223-1336).

NAS EXCHANGES WITH USSR AND EASTERN EUROPEAN ACADEMIES

The National Academy of Sciences (NAS) invites applicants from American scientists who wish to make visits beginning during the period January 1, 1986 through December 31, 1986 in the USSR, Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland, Romania and Yugoslavia. Long-term research visits of five to twelve months' duration are encouraged, particularly those where contact with colleagues in the other country has already been established.

Applicants must be US citizens and have a doctoral degree or its equivalent by the time of the intended visit in mathematics; the physical, biological, or engineering sciences; social or behavioral sciences; or biomedical sciences. For the purpose of the exchange programs, emphasis in the social and behavioral sciences is placed on those which are oriented toward empirical and quantitative analysis and which focus on the analysis of individual and group behavior. All necessary expenses will be met by the NAS and the foreign academy, including reimbursement for salary lost up to a predetermined maximum and expenses for accompanying family members on visits of five months or more.

Requests for applications should reach the National Academy of Sciences not later than February 15, 1985. Deadline for receiving completed applications is March 4, 1985; applications must be postmarked by February 28, 1985. Address application requests to: National Academy of Sciences, Office of International Affairs, USSR/EE, 2101 Constitution Avenue, NW, Washington, DC 20418. For further information: 202/334-2644.

OF POSSIBLE INTEREST

A booklet called "Overseas Employment Opportunities for Educators, School Year 1985-86" is published by: Dept. of Defense Dependents Schools, Teacher Recruitment Section, Hoffman Building I, 2461 Eisenhower Ave., Alexandria, VA 22331.

Women's Studies. Sage Publications, Inc., P.O. Box 5024, Beverly Hills, CA 90210.

Women's Studies. Indiana University Press, Tenth & Morton Streets, Bloomington, IN 47405.

Women's Studies. Temple University Press, Broad & Oxford Streets, Philadelphia, PA 19122.

Women's Issues. Human Sciences Press, Inc., 72 5th Ave., New York, NY 10011.

Women's Studies. Basil Blackwell, Inc., 432 Park Ave. South, Suite 1505, New York, NY 10016.

DEADLINES: Jan. 24 for Mar.-Apr., Mar. 24 for May-June, May 24 for July-Aug.
AD DEADLINES: Feb. 5 for Mar.-Apr., Apr. 5 for May-June, June 5 for July-Aug.
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 apiece and must be prepaid. The vacancies listed below appear in alphabetical order by state. All institutional members below are Affirmative Action/Equal Opportunity employers.

University of Alabama, Birmingham. Dept of Math, University Station, Birmingham, AL 35294. Roger T. Lewis, Chmn. Tenure track positions open. Prefer applicants with research interests in dynamical systems, mathematical physics, nonlinear analysis on Riemannian manifolds, differential topology-geometry & nonlinear differential equations. Required: promising research, good teaching record & ability to interact with members of dept. Rank & salary open. Teaching load for research faculty: 2 courses per term. Fringe benefits excellent. By 1/1/85 send resume & 3 letters of recommendation to Chmn., but applications will be considered until positions are filled.

University of Alaska, Anchorage. (1) Fall 1985 - tenure track - full-time, permanent. Ph.D in math required. Candidates finishing dissertations by 8/1985 will also be considered. Duties: teach 3 courses (9 credits) in math at undergraduate level, with service & research components also. (2) Fall 1985 - tenure track, full-time, permanent. Ph.D. in statistics or math with emphasis in Stat. required. Candidates finishing dissertations by 8/1985 will also be considered. Duties: teach 3 courses (9 credits) in applied stat. at undergraduate level, with service & research components also. By 1/31/85 send resume, transcripts & 3 letters of recommendation to Personnel Services Office, attn: Dr. Art Bukowski, Chair, Dept of Math Sciences, Univ of Alaska, Anchorage, 3211 Providence Dr, Anchorage, AK 99508.

University of Alaska, Fairbanks. Dept of Math Sciences, Fairbanks, Alaska 99701. Dr. Ronald Gatterdam, Head. Tenure track & visiting positions in math & comp. sci. Fall, 1985. PhD or equivalent required. Applicants selected on basis of teaching & research potential. Research area open. Send vita & 3 letters of reference to Head by 2/4/85 for math positions & by 3/1/85 for comp sci positions.

Loyola Marymount University. Dept of Math, Los Angeles, CA 90045. Subject to administrative approval: tenure track asst professorship Fall, 1985. Must teach wide variety of undergraduate courses. Standard teaching load is 12 hours. Dept has master's program in applied math. Required: Ph.D. Send resume to Dennis G. Zill at above address.

University of Colorado, Boulder. Dept of Math, Campus Box 426, Boulder, CO 80309. Asst professorships & assoc professorships (for strong candidates) fall, 1985. Prefer candidates whose research would complement those of current faculty. Salary range: \$24,000 - \$35,000. Applications due by 1/1/85 or by 3/1/85 for any positions not filled from initial group of applicants. Write to New Appointments, Dept of Math.

University of Colorado, Denver. Math Dept, 1100 14th St, Campus Box 170, Denver, CO 80202. Several tenure track positions in expanding applied math program, probably at rank of asst professor. Senior candidates may apply, but must have particularly appropriate credentials. Research interests should be in following fields: numerical analysis, discrete math, applied statistics, computational math, operations research, or differential equations. Industrial experience valuable. Required: commitment to excellence in teaching & research. Salary competitive. Send resume & 3 letters of recommendation to Prof. Richard Lundgren at above address.

CA State University, Fullerton. Dept of Math, Fullerton, CA 92634. (1) Several lectureships for 85/86. Required: PhD in math & evidence of outstanding teaching. Rank & salary determined by experience & qualifications. By 3/1/85 send vita, 3 letters of reference & list of coursework (or transcript) to Chair of Selection Committee. (2) Tenure track position in applied math & additional tenure opening(s) with area unspecified. For applied position area should be in one of following categories: control theory, numerical analysis, optimization modelling, or applied probability theory. Previous industrial experience valuable. Required: PhD in math, outstanding teaching qualifications & interest in continued research. Rank & salary determined by experience & qualifications. By 2/15/85 send vita & 3 letters of reference to Chair of Selection Committee.

Wesleyan University. Dept of Math, Middletown, CT 06457. Tenure track asst professorship. Analysis or probability preferred, but will consider other areas. Four-year initial appt starting 1985/86. Teaching load six hours per week. By 1/31/85 send vita & 3 letters of recommendation to Search Committee.

Florida International University. Math Science Dept, Miami, FL 33199. Dr. David Barton, Math Recruitment. Tenure track positions at all levels Jan or Aug 1985. Required: Ph.D. in math, research potential & demonstrated teaching ability. Preferred areas include harmonic analysis, algebra & mathematical logic. Send resume & 3 letters of reference to Dr. Barton.

Rollins College. Dept of Math Sciences, Winter Park, FL 32789. (1) Tenure track position in Comp Sci/Mathematics 9/1985. Competitive salary. PhD in math or comp sci required for tenure. Able to teach ACM core curriculum & some mathematics. (2) Tenure track position in math 9/1985. Competitive salary. Requires PhD, D.Ed in math education & established excellence in teaching of freshmen. Experience with audio-visual aids preferred. (3) Bush Chair in Math Science; released time & funds available for research or other project. PhD & distinguished record required. Dept offers a major in math & a major in comp sci. For all 3 positions send resume, transcripts & 3 letters of recommendation by 2/15/85 to Dean Lancaster, Box 2700.

Emory University. Dept of Math & Computer Science, Atlanta, GA 30322. Paul Whitman, Chmn. (1) Tenure track asst professorship in numerical analysis/scientific computation 8/1985. Required: PhD in math or comp sci & strong research commitment. (2) Tenure track asst professorship in applied math 8/1985. Required: strong background in analysis & good computer skills (3) Asst professorship or assoc professorship (with tenure for exceptionally well qualified applicant). Required: PhD in comp sci & strong research commitment. Will consider applicants in all areas, but prefer those in artificial intelligence, computer architecture, computer graphics, distributed computing and net-working, and operating systems. For all positions send vita, publication list & 3 letters of reference to Chmn. Position (1) due date 1/1/85. Position (2) due date 12/1/84, Position (3) due date 2/1/85.

Illinois State University. Math Dept, Normal-Bloomington, 313 Stevenson Hall, Normal, IL 61761. Albert D. Otto, Chair. (1) Tenure track position (8/1985) in combinatorics/graph theory. Desirable: add'l background in computing, applications, or operations research. (2) Tenure track position (8/1985) teaching math & stat through masters level with research preferred in linear models and statistical computing. For both positions reduced teaching load available for strong applicants. Must have or be completing PhD & show evidence or promise of excellent teaching & strong research. Rank/salary open. By 2/1/85 send vita with letters of recommendation to Chair.

University of Illinois, Urbana-Champaign. 273 Altgeld, 1409 W Green, Urbana, IL 61801. Tel: (217) 333-3352. Heini Halberston, Head. One or more junior level positions 1985/86. Minimum salary \$24,000. Required: PhD & evidence of excellence in teaching & research. By 1/31/85 send application & credentials & have at least 3 letters of reference sent to Head.

Purdue University. Dept of Math, West Lafayette, IN 47907. Joseph Lipman, Acting Head. (1) Several tenure track or research asst. professorships 8/1985. Exceptional research promise & excellence in teaching required. (2) Possibly one position at assoc prof/professor level 8/1985. Excellent research credentials required. For all positions send resume & 3 letters of recommendation.

Wabash College. Math Dept., Crawfordsville, IN 47933. Prof Bonnie Gold, Acting Chmn. Seek a recent or June 1985 Ph.D in math beginning 8/1985. First 2 years will be as a Byron K. Trippet Asst Prof. Appt includes 9 mo salary & summer research stipend. Duties: 9 hrs. teaching per week. Background in applied math, statistics or comp. sci. is desirable, but more important is strong commitment to teaching & continued research. By 2/15/85 send resume & 3 letters of recommendation to Acting Chmn.

University of Northern Iowa. Dept of Math & Comp Sci., Cedar Falls, IA 50614. Dr. David Duncan, Head. (1) Two asst/assoc professorships in computer science education fall, 1985. Duties: teach both content & methods courses related to secondary comp sci education; would also advise in MA program in comp sci education. Required: PhD in Education with background in secondary computer science education. Deadline for application 3/8/85. (2) Asst professorship in math. Preferred specialty is algebra. PhD in mathematical specialty required together with evidence of teaching ability & promise of research. Salary open & competitive. Deadline for application 3/20/85. Contact Head.

University of New Orleans. Dept of Math, New Orleans, LA 70148. Terry Watkins, Chmn. Several tenure track asst prof positions beginning 8/1985. Commitment to teaching and research required. Also several nontenure track Instructor positions to teach remedial through soph. level. Send vita and 3 letters of recommendation to Hiring Committee by Feb. 1, 1985.

University of Southern Maine. (1) Dept of Math, 96 Falmouth St, Portland, ME 04103. Dr. Merle Guay, Chmn. One or more tenure track positions 9/1/85. Required: PhD (or completed within 1 year) in operations research, statistics or applied math. Rank & salary negotiable. Send applications, graduate transcripts & 3 letters of reference by 2/22/85 to Chmn. (2) Computer Science Program. Prof. Charles Welty, Chmn, Computer Science Search Committee, 96 Falmouth St, Portland, ME 04103. One or more tenure track positions 9/1/85. Prefer applicants with PhD in comp sci or equivalent professional experience & evidence of scholarly achievement. Send vita & names of 3 professional references to Chmn.

Hood College. Dept of Math & Computer Science, Frederick, MD 21701. E. B. Chang, Chmn. One or two tenure track positions in Computer & Information Sciences. Position may begin Jan. or Aug., 1985. Rank & salary dependent on qualifications. Required: terminal degree in comp sci or math or other allied field with substantial graduate study or professional experience in comp sci. Excellence in teaching essential. Duties: teaching graduate & undergraduate comp sci courses & ability to lead existing Master's program. Send resume, application & have 3 letters of recommendation sent to Chmn.

Smith College. Dept of Math, Northampton, MA 01063. Kathy Bartus, Secretary. Three-year tenure track asst professorship. Required: PhD in stat or in math with research area in stat. Submit resume & 3 letters of reference (including one evaluating your teaching) to Kathy Bartus.

Wellesley College. Dept of Math, Wellesley, MA 02181. At least one three-year position at asst professor level beginning Fall 1985. Requirements include PhD in mathematics (completed, or expected by June, 1985), excellence in and commitment to mathematical research & undergraduate teaching in a liberal arts environment. Applicants should send a curriculum vitae and at least three letters of recommendation that address both teaching and research. Contact Chairman, Dept of Mathematics.

Worcester Polytechnic Institute. Dept of Math Sciences, 100 Institute Rd, Worcester, MA 01609. Bruce McQuarrie, Chair. Tenure track asst professorship in stat/applied probability. Required: strong commitment to scholarship, excellent teaching & interest in statistical consulting. Send resume to Chair.

Delta College. Mathematics & Computer Science Division, University Center, MI 48710. Full time tenure track instructorship 8/1985. Required: Master's Degree in math or comp sci or related field, e.g. statistics or engineering. Competence to teach math through calculus. Desirable: teaching experience & job related experience other than teaching; strong background in statistics; ability to teach computer programming courses in FORTRAN, BASIC OR PASCAL; ability to work effectively with others. Duties: teach courses ranging from arithmetic to differential equations, course in applied math for technology programs, and elementary statistics. Salary based on education & experience. Excellent fringe benefits. By 4/5/85 send resume, 3 letters of reference & copies of transcripts to Personnel Office.

Eastern Michigan University. Dept of Math & Comp Sci, Ypsilanti, MI 48197. Hartmut Höft, Acting Dept Head. The Department is dividing into two (2) departments effective Fall, 1985 and is accepting applications for the two headships as well as for tenure track faculty positions in the two sister departments. (1) Dept Head of Math at rank of full professor. Required: PhD with at least 7 years of teaching & proven research competence. Dept has undergraduate & evening graduate math & math education programs. Apply by 3/1/85. (2) Several tenure track asst professorships. PhD in a math science is required. Will consider all areas of specialization. Apply by 3/1/85. (3) Dept Head of Comp Sci at rank of full professor. Required: PhD in comp sci with at least 7 years of teaching or industrial experience. Proven research competence & effective leadership in new program development are desirable. Apply by 3/21/85. (4) Several tenure track positions in comp sci. Rank & salary dependent on qualifications. Required: PhD in comp sci or related field with extensive experience in comp sci. Duties: teach undergraduate & graduate courses; particular needs exist in areas of computer architecture, real time processing & software engineering. Apply by 3/21/85. For all positions send resume & letters of recommendation to 310 King Hall, Eastern Michigan University, Ypsilanti, MI 48197.

Michigan State University. Dept of Math, East Lansing, MI 48824. Prof Kyung Whan KWUN, Chmn. (1) Two postdoctoral fellowships in math, 2 year appt. Duties: teach one course each term & devote remaining time to research. These fellowships are normally offered to persons (regardless of age) who have had their doctorate less than 2 years. (2) Several tenure system openings 9/1/85, probably at asst prof level, but may be at assoc prof or full prof level. Important: PhD in math, excellence in research (numerical analysis & other fields) and in teaching. For all positions send resume & have 3 letters of recommendation sent to Chmn by 1/18/85.

Michigan Technological University. Dept of Math & Comp Sciences, Houghton, MI 49931. Dr. Deborah Frank Lockhart, Acting Head. Tenure track & visiting positions in math, statistics & comp sci available 9/1985. Required: excellent teaching & commitment to research. Some 3 year instructorships may be open. Apply to Acting Head.

Michigan Technological University. Dept of Math & Comp Sciences, Houghton, MI 49931. Position of Department Head. Required: well-established reputation in research & special interest in applied math, statistics or computer science. Commitment to active research and effective teaching is necessary. Send resume & have 3 letters of recommendation sent to MACS Search Committee at above address.

University of Michigan, Dearborn. Dept of Math & Stat, Dearborn, MI 48128. Michael Lachance, Chmn, Search Committee. Two tenure track asst professorships 9/1985. Required: teaching & demonstrated research capability. Preferred areas: applied math and/or computer science. One of the positions will require teaching both undergraduate comp sci & math. Teaching load: 9 credit hours per semester. Send resume & have 3 letters of recommendation sent to Chmn.

College of Saint Benedict. Dept of Math, Saint Joseph, MN 56374. This women's college has 2 openings (one tenure track & one replacement) in math. This Math Dept is a joint dept with Saint John's University (a men's college). The two colleges have a combined curriculum & coeducational classes. Rank & salary depend on applicant's background. PhD preferred (required for tenure). Evidence of effective teaching is also required. By 2/1/85 send vitae, official transcripts & 3 letters of recommendation to Kathy Flynn, Wage & Benefit Coordinator.

College of St. Catherine. Dept of Math Sciences, St. Paul, MN 55105. Three tenure track positions Fall, 1985. One position requires Ph.D. (or candidacy) in math; the second requires Ph.D (or candidacy) in math with interest in comp sci desirable; the third requires M.S. (Ph.D preferable) in comp sci. Commitment to undergraduate teaching. Rank & salary for each position dependent upon qualifications & experience. By 1/15/85 send resume, transcripts & 3 letters of recommendation to P. M. Tomsich.

University of Minnesota, Duluth. Dept of Math Sciences, Duluth, MN 55812. Two professorships 9/1/85. Rank dependent on qualifications. Competitive salary. Teach 6-8 hrs/wk in undergraduate comp sci. Conduct research in comp sci or related math. Help develop master's program in comp. sic. Required: Ph.D in comp sci (or in closely related field), documented teaching & research record in comparable position for advanced ranks. By 1/31/85 send application, resume & 3 letters of recommendation to Dr. Mark Luker.

University of Nebraska, Lincoln. Dept of Math & Stat, Lincoln, NE 68558. Several tenure track asst professorships 8/1985. Required: PhD with outstanding research potential & excellence in teaching. Salary competitive. Areas of interest: applied math, statistics, optimization/control, algebra, analysis, differential equations or numerical analysis. Apply by 3/1/85 (or later if not filled). Send vita & 3 letters of recommendation to Search Committees, Dept of Math & Statistics.

Rutgers State University, Camden. Dept of Math Sciences, Camden, NJ 08102. Asst or assoc professorship. Required: PhD in math & strong commitment to research & teaching. All fields considered. Send resume & 3 letters of recommendation (and for new PhD's a summary of thesis and statement of research plans) to Howard Jacobowitz.

Rutgers State University, Newark. Dept of Math & Comp Science, Smith Hall, Newark, NJ 07102. Jane Gilman, Chair. One or two tenure track asst or assoc professorships, Fall, 1985. Required: PhD & demonstrated strong research accomplishment or potential. Duties: teach undergraduate & possibly graduate comp sci courses. Teaching load: 9 hrs. per semester. All fields of comp sci acceptable. Research interests in Dept include artificial intelligence, representation theory & automorphic forms, combinatorics & logic, low dimensional topology and Teichmuller theory, differential algebra & category theory, and probability. Send resume & 3 letters of recommendation to Chair.

Herbert H. Lehman College(CUNY). Dept of Math & Comp Sci, Bronx, NY 10468. Prof. Robert Feinerman, Chmn. Tenure track positions anticipated. Need applicants who can participate in both comp sci programs and math programs. Required: PhD & strong commitment to teaching & research. Rank & salary commensurate with qualifications. Send resume to Chmn.

Rensselaer Polytechnic Institute. Dept of Math Sciences, Troy, NY 12180. J.G.Ecker, Acting Chairman. Anticipate tenure-track openings at all levels 9/1985. PhD and strong research potential in applied mathematics and/or scientific computation required for junior-level appts and demonstrated record in one of these fields for senior-level appts. Teaching 6 to 7 hours/week per semester. Also anticipate two or three visiting & postdoctoral appts - all levels.

University of Rochester. Dept of Statistics, Hylan 710, Rochester, NY 14627. Asst professorship (or above) 7/1985, at salary of \$23,000 up. Required: strong research potential in theory & methodology, dedication to teaching & PhD or one near completion. Joint appts in Biostatistics (School of Medicine & Dentistry) possible. Send resumes, letters of recommendation & any technical reports or papers (or thesis abstracts) to Statistics Search Committee at above address.

University of North Carolina, Chapel Hill. Math Dept, Chapel Hill, NC 27514. John A. Pfaltzgraff, Chmn. (1) Tenure track appts Fall, 1985 for applicants with Ph.D's and strong research programs in P.D.E; applied & computational aspects of analysis or algebra. Strong candidates in other fields may be considered. Rank & salary according to qualifications & budget conditions. By 1/10/85 send vitae, abstract of current research & 4 letters of reference to Chmn. (2) Two year, fixed term lectureship 8/1985 for applicants with Ph.D's and research programs in algebraic geometry or singularities. Dept will conduct special research year in algebraic geometry & singularities with distinguished visitors during 1985-86. By 1/31/85 send vitae, abstract of current research & 4 letters of reference to Chmn.

Lewis & Clark College. Dept of Computer Science, Portland, OR 97219. Harvey Lee Shapiro, Head. Position in expanding comp sci program, While PhD is preferred, others should apply. Duties: teach broad spectrum of undergraduate courses. College stresses quality undergraduate teaching, supports continuing faculty development & provides opportunity for research. By 2/21/85 send vita, transcripts & 3 letters of recommendation to Prof. Shapiro.

Carnegie-Mellon University. Dept of Math, Schenley Park, Pittsburgh, PA 15213. Prof George J. Fix, Head. Applied Stochastic Analysis Position. Tenure track asst professorship Fall, 1985. Prefer applicants in general area of stochastic processes. Required: strong mathematical background & research interests in stochastic control, queueing, reliability, mathematical statistics, diffusion processes. In exceptional cases appt at higher level will be considered. Send resume, transcript & 3 letters of reference to Head.

Drexel University. Dept of Math & Computer Science, Philadelphia, PA 19104. Dr. Loren Argabright, Head. Several tenure track openings 1985/86. Areas of special interest include classical & modern analysis, differential equations, special functions, applied statistics & stochastic modeling, numerical analysis, operations research, scientific computing, computer graphics, operating systems, languages & compilers, computer architecture, database systems, & artificial intelligence. Send resume & names of 3 references to Head.

Pennsylvania State University, Capitol Campus. Middletown, PA 17057. Tenure track faculty position in Computer Science 8/18/85. Rank & salary dependent on qualifications. Preferred: PhD in comp sci or related area. Required: potential for growth as a computer scientist. Duties: undergraduate teaching & research. Send resume, transcripts & references to Dr. Ruth Leventhal, Provost/Dean, Box AWM, at above address. Position open until filled.

University of Pennsylvania. Dept of Math (E1) Philadelphia, PA 19104. Prof. Herman R. Gluck, Chmn, Personnel Committee. (1) One or more tenure positions 7/1/85. Want candidates with recognized research achievements who are successful teachers of undergraduate & graduate students. Prefer candidates in algebra. Salary & rank dependent on experience. Contact Prof. Gluck. (2) Several faculty positions 7/1/85. Required: strong research credentials & potential for successful teaching of undergraduate & graduate students. By 1/1/85 send resume & 3 letters of reference describing both teaching & research ability to Prof. Gluck.

College of Charleston, Math Dept., Charleston, SC 29424. W. L. Golightly, Chmn. Three tenure track junior or senior level positions Fall, 1985. Required: Ph.D in one of math sciences, commitment to undergraduate teaching & potential for continuing research. Teaching: 12 hrs/wk; course reductions for those engaged in research. Minimum salary \$25,000. Send resume & have 3 letters of recommendation sent to Chmn.

South Dakota School of Mines & Technology. Dept of Math & Comp Sci, Rapid City, SD 57701. David Ballew, Chmn. (1) Want mathematicians to teach undergraduate computer science. Normally will teach 2 courses in comp sci or math and one in math or comp sci. PhD is necessary for tenure. (2) Want replacement for sabbatical leave (one year). Would especially like retired or almost retired senior level person who wants to visit Black Hills.

University of Tennessee. Dept of Math, Knoxville, TN 37996. John S. Bradley, Head. Junior level tenure track positions 9/1985. Research interests should be compatible with those of present faculty: algebra, analysis, integral equations, mathematical ecology, numerical analysis, ordinary & partial differential equations, probability, topology, statistics. Expect visiting positions with level depending on qualifications. Send resume to Head.

University of Texas, Austin. Math Dept, Austin, TX 78712. Three asst professorships & six instructorships Fall, 1985. All candidates should have PhD. Asst professor candidates should have strong research records, & instructor candidates should have research interests in areas in which Dept has strength. Early rounds of decisions will be made in mid-January, followed by later rounds. Send inquiries to Peter A. Tomas at above address.

Norwich University. Mathematics/Computer Science, Northfield, VT 05663. Ernest D. True, Chmn. Instructor of asst prof (tenure track) of math 9/1985. Duties: teach wide range of undergraduate courses to majors in math, comp sci, engineering & business. PhD in math or comp sci preferred with interest in graph theory, number theory, geometry or numerical analysis. Emphasis on excellent teaching. By 2/1/85 send application, vitae & 3 letters of reference to Chmn.

Trinity College. Natural Sciences & Mathematics, Burlington, VT 05401. Dr. Carol Allen, Chair. Asst professorship in math 9/1985. Teaching 12 credit hours per semester. Duties: teach college math, upper level courses for math majors & introductory computer science. Prefer candidates with PhD or extensive teaching experience. By 2/1/85 send C.V. & 3 letters of recommendation to Chair.

College of William & Mary. Dept of Math, Williamsburg, VA 23185. John Drew, Chmn. Two tenure track positions 9/1985. Required: PhD in one of math sciences plus strong commitment to teaching & research. Will consider all areas but prefer applied statistics, numerical analysis & other areas of applied math. Send resume & 3 letters of reference to Chmn.

University of Wisconsin, Madison. Math Dept, 223 Van Vleck Hall, Madison, WI 53706. Prof. J. Marshall Osborn, Chmn. (1) Possible tenure track appointment Fall, 1985. Seeking mathematicians of established excellence. Salary based on qualifications & experience. Send applications by 1/31/85 to Chmn. (2) Van Vleck Asst. Professorship. Seeking outstanding mathematicians (of any age) who are recent recipients of doctorate. Appointee must interact well with members of Dept, like teaching & be able to contribute to research & instructional programs. Teaching load: 2 courses per semester. High probability of additional income through research or teaching during summer between consecutive years of appointment. Salary (at least \$23,500) dependent on experience. All positions are for two or three year terms. Apply by 12/31/84. Application forms may be obtained from Chmn.

Queen's University. Dept of Math & Statistics, Kingston, Ontario K74 3N6. Prof. L.L. Campbell, Head. One tenure track position & some one-year positions 7/1/85. Tenure track position is in statistics. Candidate should have demonstrated research potential & teaching ability. Sabbaticants & others who wish to teach part-time or for one term are invited to apply. Send vita & have 3 letters of recommendation (one commenting on teaching ability) sent to Head. This advertisement is directed to Canadian citizens & permanent residents in accordance with Canadian immigration requirements.

York University. Dept of Math, N520 Ross Bldg, North York, (in Toronto), Ontario M3J 1P3, Canada. Philip Olin, Chmn. Tenure track asst professorships (or possibly higher level) & also limited-term positions of one, two or three years' duration, 7/1/85. Prefer applicants in statistics, operations research, applied analysis & discrete math. Required: proven ability or demonstrated potential for research & teaching. Cross appts with other depts are possible. Send applications with detailed curriculum vitae to Chmn.

Late Arrivals

CA State College, Bakersfield. Dept of Math & Comp Science, Bakersfield, CA 93309. Two positions in computer science. Depending on qualifications these may be tenure track, at any rank plus cost of living raise to be determined. Possible salary supplement. Prefer candidates who hold or are near completion of PhD in comp sci. Must at least hold Master's degree & experience in comp sci. Will consider all areas. Contact Laird E. Taylor at above address by 1/16/85.

CA State University, Chico. Dept of Math, Chico, CA 95929. Jim Jones, Chair. Two one-year full time temporary replacements. Asst prof/prof depending on qualifications. 12 unit/semester, committee work, mathematical activity. PhD in math required and teaching excellence a primary consideration. By 2/15/85 send resume, supporting documents and 3 letters of reference to Chair.

San Jose State University. Dept of Math & Comp Science, San Jose, CA 95192. Dr. John Mitchem, Chair. Six tenure track asst/assoc professorships (or full professorship in an exceptional case.) PhD by 8/1985 in any math science but prefer comp sci, stat, applied math or math education. Candidates must have commitment to quality teaching, interest in curriculum development & departmental affairs. Approx salary \$22,000 - \$40,000. Teach 12 hrs/sem. Significant professional activity required for tenure. By 2/6/85 send vita & 3 letters of reference to Chair.

Trinity College. Dept of Math, Hartford, CT 06106. Ralph E. Walde, Chmn. Tenure track asst professorship 9/1985. Required: PhD in one of math sciences; demonstrated excellence in teaching, especially at first & second year levels; specialty in one of following areas: combinatorics, graph theory, numerical analysis, theory of computation, analysis of algorithms, or modeling; desire to teach in two of above areas; familiarity with computing. Teaching load: 3 courses per semester. By 2/15/85 send detailed curriculum vitae, academic record & at least 3 letters of reference to Chmn.

Trinity College. Dept of Engineering & Computer Science, Hartford, CT 06106. Prof. Joseph D. Bronzino, Chmn. Tenure track position 9/1985. Initial appt for 3 years. Duties: developing & teaching undergraduate comp sci courses, fostering interdisciplinary activity related to computing, and conducting continuing research within comp sci. Required: PhD in comp sci or closely allied field. Prefer specialty in compiler or operating system design. Salary & rank commensurate with experience. Send curriculum vitae & list of 3 references to Chmn by 3/31/85.

University of Connecticut. Dept of Math, Box U-9 WIM, Storrs, CT 06268. Asst professorship at Groton Regional Campus to teach 3-4 courses per semester of elementary & intermediate math & to do research in field of specialization. Required: PhD in math & some teaching experience. Will consider those expecting to complete thesis for PhD. Research potential desirable. Salary negotiable. By 2/15/85 contact Dr. H.M. Roberts at above address.

Kansas State University. Dept of Mathematics, Manhattan, KS. R. Richard Summerhill, Head. Several temporary (9-month) asst professorships 8/15/85. Salary commensurate with qualifications. Will consider all fields of math. Strong interest in teaching and research expected. Required: PhD or equivalent. By 4/1/85 contact Head.

Oakland University. Dept of Math Sciences, Rochester, MI 48063. Donald E. G. Malm, Chair. (1) Tenure track asst professorship 8/15/85. Required: PhD with strong potential for research. Send resume, graduate transcript & 2 letters of recommendation to Chair. (2) Tenure track position in Statistics with growing MS Degree Program in Applied Statistics. Duties: teaching, research & consulting. Strong partnership programs with auto industry are being developed to provide many opportunities for consulting & research in applied areas. Send C.V. & 2 letters of reference to Chair.

Southwest State University. Math/Comp sci Dept, Marshall MN 56258. Tenure track asst/assoc professorship in math 9/1985. Teach all levels of undergraduate math, participate in student advisement & program development. Masters degree required, PhD in math preferred & required for tenure. Prefer applicants with teaching experience and/or ability to teach comp sci. Salary range 84/85 \$19,048 - \$33,432. Send letter of inquiry or application (with resume) to Dr. Paul Enersen at above address.

Trenton State College. Dept of Math & Comp Sci, Hillwood Lakes, CN 550, Trenton, NJ 08625. Dr. Walter Ehrenpreis, Chair. Three tenure track asst professorships in following areas: (1) Statistics: teach stat at undergraduate & graduate level. Experience in statistical computation desirable. PhD in stat required. (2) Computer Science: teach comp sci at undergraduate level. Master's degree in comp sci required with willingness to pursue PhD. (3) Math/Comp Sci: teach math at undergraduate & graduate levels with ability to teach comp sci. PhD required. By 3/1/85 apply to Chair.

Hobart & William Smith Colleges. Dept of Math & Computer Science, Geneva, NY 14456. Prof. Irving Bentsen, Chmn. (1) Asst or assoc professorship. Required: PhD in math with strong background (preferably a Master's) in comp sci, or PhD in comp sci with strong background in math. Teach all levels of undergraduate math & comp sci & participate in General Curriculum. (2) Asst professorship. Required: PhD in math & some background & strong interest in comp sci. Teach all levels of undergraduate math & comp sci & participate in General Curriculum. For both positions applicants should have strong commitment to excellence in teaching & promise of continued scholarly activity. Teach 2 courses per trimester. Salary negotiable. Good fringe benefits. Send resume, 3 letters of recommendation (one including comments on teaching ability) & undergraduate & graduate transcripts to Chmn.

Oberlin College. Dept of Math, Oberlin, OH 44074. George Andrews, Chmn. Visiting position for 1985/86. Rank & salary depend on qualifications & experience. Required: PhD completed or expected by 9/1985, strong commitment to undergraduate teaching & research. Send vita, transcripts & at least 3 letters of reference. Application date: 2/15/85 or until position is filled. We particularly welcome applications from women & minority candidates.

Oregon State University. Dept of Math, Corvallis, OR 97331. Dr. P. M. Anselone, Chmn. (1) Tenure track asst professorship 9/1985. Will consider all areas of math including math education. Required: PhD or equivalent. Duties: research activity, teaching 6 to 8 hours per week. Salary negotiable, depending on qualifications. By 1/15/85 contact Chmn. (2) One year visiting appts. All areas of math will be considered including math education. Required: PhD or equivalent training & experience. Will consider all professional ranks. Visiting rank will be same as person's rank at home institution. Prefer applicants whose research augments areas of current research in Dept and who have expertise to meet specific instructional needs. Either full or part time appt can be arranged. Full time duties: teach 6 to 8 class hours per week. Renewals may be possible. By 3/1/85 write to Chmn.

Chatham College. Dept of Math, Woodland Rd, Pittsburgh, PA 15232. William A. Beck, Chmn. Visiting instructor or asst prof 9/1985, DA or PhD. Undergraduate program including applications of algebra & calculus to business & economics, linear algebra, intermediate analysis, statistics, computer-based numerical analysis. Advising, independent studies, senior tutorials. Six courses per year. By 2/15/85 send application, resume & names of 3 references to Chmn.

Vanderbilt University. Dept of Math, Nashville, TN 37235. Prof R. R. Goldberg, Chmn. (1) Asst prof (PhD required) with 2 year appt. Not tenure track but intended for person with research potential. Looking for person who works in area of one of departmental strengths which include universal algebra, differential equations, graph theory & topology. Have vita & 4 letters of recommendation (including one about teaching) sent to Chmn. (2) Asst professorship in an area of theory of infinite discrete groups. Prefer one in field of combinatorial group theory. Initial 3 year appt Fall 1985 (renewable, tenure track). Required: outstanding research potential & evidence of effective teaching. (3) Asst professorship in an area of combinatorial optimization. Initial 3 year appt Fall 1985 (renewable, tenure track). Required: outstanding research potential & evidence of effective teaching. For last 2 positions have vita & 4 letters of recommendation sent to Chmn.

University of Richmond. Dept of Math & Comp Sci, Richmond, VA 23173. J.F. Kent, Chair. Two tenure track asst professorships in math & one tenure track asst/assoc professorship in comp sci Fall, 1985. Dept graduates 25-30 majors a year, half of whom are women. Commitment to teaching undergraduates while remaining active in research is required of each faculty member. Required: PhD in math by Fall, 1985. Salaries competitive. Contact Chair.

Lewis and Clark College: Dept of Math, Portland, OR 97219. Tenure track position 9/1/85. Required: PhD, some experience teaching undergraduates, strong commitment to liberal arts environment & serious continuing interest in research. Want specialists in analysis. Teaching load 10 hours per week. Rank & salary commensurate with experience & qualifications. By 2/15/85 send application (including career interests, priorities & goals), resume and 3 letters of recommendation to Prof. Roger B. Nelsen at above address.

University of North Carolina, Greensboro, NC 27412. Tenure professorship with initial appt as Dept Head. Dept offers undergraduate instruction in math, comp sci & stat, and MA & MEd in math. Required: outstanding research record & commitment to excellent teaching. Head administers Dept made up of 25 faculty members & over 200 majors & provides leadership in areas of teaching, research & service. Salary commensurate with experience & qualifications. Send credentials & 3 letters of recommendation to Karl Ray Gentry, Chair, D. H. Search Committee.

Mankato State University. Dept of Math, Mankato, MN 56001. F.T. Hannick, Chairperson. Tenure track position (s) fall, 1985 in Math/Math Education. Want PhD's in all areas of math, especially applied math & math education, to apply. Duties: teach math, supervise masters level graduate students & conduct modest research. Salary at least \$23,000 depending on qualifications. Send application, vita & 3 letters of reference to Chairperson. Deadline 2/15/85 or until filled.

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