

FOCUS

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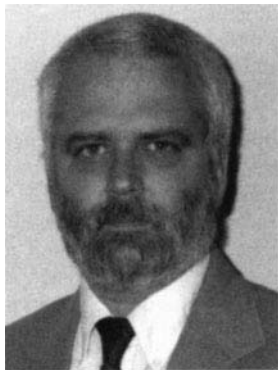
THE NEWSLETTER OF THE MATHEMATICAL ASSOCIATION OF AMERICA

December 1991

Ewing Named as First Pólya Lecturer

The MAA has announced that John H. Ewing of Indiana University is to be the Association's first George Pólya Lecturer.

The Pólya Lectureship was established recently by the Association to promote the ideal of excellent exposition in mathematics, an ideal associated in many minds with the name of the former Stanford mathematician George Pólya. Chosen annually by a committee, currently consisting of Judith V. Grabiner, Paul R. Halmos, Dennis A. Hejhal, Ivan M. Niven, and Mary Ellen Rudin, the Pólya Lecturer is appointed for a period of two academic years and is expected to give three lectures at MAA Section meetings during each academic year. In addition to an honorarium, the Association presents the Lecturer with a certificate and arranges for the recipient's name to be engraved on a commemorative plaque located in its Washington, DC headquarters.



John H. Ewing was born in Bronxville, New York in 1944. He obtained his PhD from Brown University in 1971. He has been on the mathematics faculty at Indiana University since 1973, serving as department chair from 1986 to 1989. In 1975 he won the MAA's Lester R. Ford Award for Expository Writing. He was editor of the *Mathematical Intelligencer* from 1981 to 1987, and is the new editor of the *American Mathematical Monthly*, having served as its associate editor (at large) since 1987.

"We all admired Pólya," said Ewing after he had been informed of the award, "so I am both flattered and honored to have been chosen as the first Pólya Lecturer." The first two of his three Pólya Lectures for this coming year have already been scheduled. Ewing will speak at the Ohio Section meeting on 27 March 1992 and at the Southeastern Section meeting on 10 April 1992. The title of his talk at both meetings will be *Can We See the Mandelbrot Set?* (The lecture schedule for the Pólya Lectures is determined by the MAA Committee on Sections, with each Section hosting a Pólya Lecturer approximately once every five years.) ■

Barrett Takes NSF Position

Lida K. Barrett, Dean of the College of Arts and Sciences at Mississippi State University, has taken a position as Senior Advisor on Precollege Education at the National Science Foundation (NSF). In this newly created position, Barrett will serve as primary advisor to the Assistant Director for Education and Human Resources (EHR), Luther Williams, to provide analysis and coordination of NSF educational programs.

The position is aimed at two goals: first, to examine the range of NSF educational programs and formulate an overview of what is being done and what gaps there might be, and second, to act as a facilitator to insure that the various EHR programs complement and enhance one another.

Barrett says that one of her first projects will be a report on existing school programs. "There are a lot of problems in education, but there are also a lot of answers," she notes. She will be analyzing the components of school programs in mathematics and science to determine the ingredients that make them successful. "We need to see what makes them work, how dependent they are on a particular setting, whether they are translatable to other settings."

She will also look at networking programs that link teachers, schools, and organizations and try to determine how such programs can be used to disseminate information about educational projects. Electronic communications will likely play a key role in this area.

The EHR staff now has a substantial representation in mathematics. "There is as much mathematics as science at the school level, so we ought to be heavily represented," she remarks. "I would say that half the staff should be in mathematics, but that's me talking as a mathematician!" She also encouraged those in the mathematical sciences community who have an interest in education to get in touch with EHR, to inquire about serving as rotators, reviewers, or members of reviewing panels.

Barrett's position also involves coordination and cooperation with other Washington organizations that deal with education. For example, she has attended meetings of a congressional committee that is examining standards for educational testing. She will act as a liaison with the National Governors' Association (NGA), which (*Barrett continues on page two.*)

Mathematical Center Fund Breaks \$500,000

As of 15 November 1991, the campaign for the MAA Mathematical Center went over the \$500,000 mark, more than 80 percent of our \$600,000 goal. The number of donors totals 515 with a year remaining in the campaign.

Strategic Planning Questionnaire

You are soon going to have the opportunity to help plan for the MAA's future. There will be an all-member questionnaire in the next issue of FOCUS on the importance and effectiveness of MAA activities, and on goals and future directions. It will take only a few minutes to complete.

WATCH FOR THE ALL-MEMBER QUESTIONNAIRE IN YOUR NEXT FOCUS AND PLEASE PARTICIPATE!

Preliminary results of the survey will be made available at the time of the spring Section meetings. The results will also be incorporated in the strategic plan that will be written next spring and submitted to the Board of Governors in draft form in August 1992 and for final approval in January 1993.

Strategic planning is being led by a sixteen member Task Force appointed by President Deborah Tepper Haimo. The Task Force met for two days in Orono last August, and again at MAA headquarters in Washington, DC. A draft plan will be submitted to the Board of Governors in August 1992 and for final approval in January 1993.

Thomas W. Tucker, Chair
Strategic Planning Task Force

(Barrett continued from front page.)

has been active in educational matters in the past couple of years. In addition, she will keep abreast of activities at the Department of Education (DOE) and at the National Research Council (NRC), particularly the Mathematical Sciences Education Board (MSEB) and the NRC's newly created Coordinated Council on Education (CCE).

Prior to taking the NSF position, Barrett served as dean at Mississippi State University for four years. Before that, she was on the mathematics faculty of the University of Tennessee at Knoxville for nineteen years, serving as department chair from 1973–1980. She was president of the MAA during 1989 and 1990.

The timing of the creation of her NSF position is linked with the large increases in funding the education directorate has received **from Congress over the last few years.** Part of the motivation for creating this position, Barrett says, is to figure out "how to best use the interest and fiscal support coming from Congress." As for grumbling from the NSF research divisions over the increases EHR has received, Barrett comments that "the research divisions and EHR are working well together, especially in mathematics In the long run, this attention to education will help everyone." ■

Red faces all around the FOCUS desk this month following the typo in our announcement of the MAA election results in the October 1991 issue. Susan L. Forman, the newly elected First Vice President of the MAA was the Second Vice President of the Metropolitan New York Section. An unobserved slip at the keyboard caused our computer to swallow up the last part of that phrase, leaving the erroneous impression that Susan is currently Second Vice President of the MAA, a position that is, in fact, occupied by Peter A. Lindstrom of North Lake College in Irving, Texas. Apologies to all concerned, and congratulations again to Susan Forman on her election. ■

Secretary's Report

Gerald L. Alexanderson, MAA Secretary

The Summer Joint Meetings, held in Orono, Maine in August 1991, were extraordinarily successful, with an excellent scientific program and outstanding recreational activities for participants and their families. All of those who attended owe a debt to the members of the Joint Meetings Committee. I realize it's dangerous to single out individuals but I'll do so anyway. Hope Daly and Kenneth A. Ross are, I believe, largely responsible for the original ideas leading to the revised format for summer meetings: the scientific program primarily in the mornings, with committee meetings and recreational activities in the afternoons. They deserve a lot of credit.

This is not to say that the business of the Association was slighted. With the meetings of the Strategic Planning Task Force held for two days prior to the meetings of the Executive and Finance Committees and the subsequent meetings of the Board of Governors, officers of the Association and others spent several days in all-day meetings prior to the formal opening of the meetings, which took the form of an awards banquet. Afternoons were filled with committee meetings and these continued through the Sunday following the regular sessions.

The Board of Governors heard a series of encouraging reports from Executive Director Marcia P. Sward and from Rhoda Dechter Goldstein, Associate Director for Administration and Finance, as well as from Treasurer Donald L. Kreider. The Association is thriving. Professor A. B. Cunningham of West Virginia University, who died in May, bequeathed a significant part of his estate to the Association; the Board took action to accept this bequest. (For additional information on this bequest, see page eight of the October 1991 issue of FOCUS.) The Board included in its meetings a workshop on issues of diversity.

The Board elected Kenneth A. Ross to a second term as Associate Secretary. Recipients of the Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics, the Chauvenet Prize, and Certificates of Meritorious Service were approved by the Board. The awards will be presented at the Business Meeting in Baltimore, Maryland in January 1992.

The Board decided to forego having a series of Hedrick Lectures in 1992. There will be no regular summer meetings that year since the International Congress on Mathematical Education (ICME-7) is meeting in Québec. (For additional information on the ICME-7 meeting program, see page ten of the September 1991 issue of FOCUS. For additional information on the summer 1992 plans of the MAA and the American Mathematical Society (AMS), see page seven of that issue.)

John H. Ewing was approved by the Board as the first George Pólya Lecturer in what the Association plans as a long series of distinguished lecturers for Section meetings. The lectureship was established in recognition of the sizeable bequest to the MAA from the estate of George and Stella Pólya in 1989. (See the related article on Ewing and the Pólya Lectureship on the cover page of this issue of FOCUS.)

At the Business Meeting of the Association, a Certificate of Appreciation was presented to Andrew Sterrett, Jr. of Denison University for his many contributions over the years to the Ohio Section and to the work of the Washington office as Interim Associate Director for Publications and Programs. ■

Gerald L. Alexanderson is Professor of Mathematics at Santa Clara University. In addition, he currently serves, along with Loren C. Larsen, as Associate Director of the MAA's Committee on the Putnam Prize Competition.

CBMS Survey of Undergraduate Programs

Donald C. Rung

The 1990 Survey of the Conference Board of the Mathematical Sciences (CBMS) is nearly complete. Every five years, CBMS reports on undergraduate programs in mathematics, statistics, and computer science in both two- and four-year institutions. Publication of the report, *Statistical Abstract of Undergraduate Programs in the Mathematical Sciences and Computer Science: 1990-1991* is expected in early 1992.

FOUR-YEAR COLLEGES AND UNIVERSITIES Fall 1990 enrollment was 1,926,000 in mathematics; 45,000 in statistics; and 317,000 in computer science. Full-time faculty totals were: for mathematics, 19,411, a 9 percent increase over 1985; for statistics, 735, unchanged from 1985; and for computer science, 5,318, a 48 percent increase over 1985. The mathematics department enrollment contains significant enrollments in statistics and computer science, teaching 72 percent of the 173,000 total statistics enrollment and 37 percent of the 491,000 total computer science enrollment. Both computer science and statistics total enrollments declined by more than 10 percent over 1985 figures; mathematics remained level.

In mathematics departments, enrollments in courses at the calculus-level and above (including advanced statistics and middle and upper level computer science) are 44 percent of the total department enrollment; the comparable figure for statistics is 36 percent; for computer science it is 35 percent.

The total bachelor degrees awarded in mathematics and statistics was 19,191, a decrease of 5 percent over 1985 (mostly in joint mathematics-computer science degrees). Computer science degrees were 21,126, a decrease of 27 percent from 1985.

For the first time, faculty in mathematics departments were reported according to their teaching responsibilities. Those faculty teaching only mathematics/statistics courses totaled 16,090; those teaching only computer science courses equalled 1,492; while those regularly teaching both numbered 1,829. It is interesting to note how the number 16,090 compares with the 15,655 mathematics department faculty total of 1970 when presumably fewer computer science courses were offered.

In 1990, women comprised 20 percent of the total mathematics department faculty, 14 percent of the statistics faculty, 16 percent of the computer science faculty, and 34 percent of the two-year faculty. Among faculty of age less than 35, the percents of women faculty were 25, 24, 12, and 20, respectively.

The 1990 average age for faculty in mathematics departments was 45.6; for statistics department faculty, 44.8; for computer science, 41.9; and for two-year faculty, 45.4.

In 1989-1990, the death and retirement percent for mathematics department faculty was 1.6 percent; for statistics department faculty, 2.3 percent; and for computer science department faculty, .9 percent.

TWO-YEAR COLLEGE PROGRAMS Enrollment in mathematics programs in two-year colleges increased by 35 percent over 1985, reaching 1,392,000 in fall 1990. Unfortunately, the 15 percent increase in full-time faculty over 1985 to a 1990 total of 7,222 failed to keep pace with enrollment. As a result, there are now 13,680 part-time mathematics faculty in two-year institutions.

A more comprehensive synopsis will be presented in a subsequent article in FOCUS early in 1992. ■

Donald C. Rung is the Executive Director of the 1990 CBMS Survey, STATISTICAL ABSTRACT OF UNDERGRADUATE PROGRAMS IN THE MATHEMATICAL SCIENCES AND COMPUTER SCIENCE: 1990-1991, published by the MAA and available in 1992.

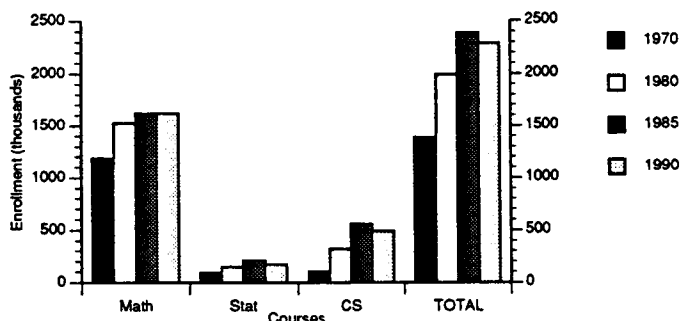


FIGURE 1. Enrollment in mathematics, statistics, and computer science courses at four-year colleges and universities: fall 1970, 1980, 1985, and 1990.

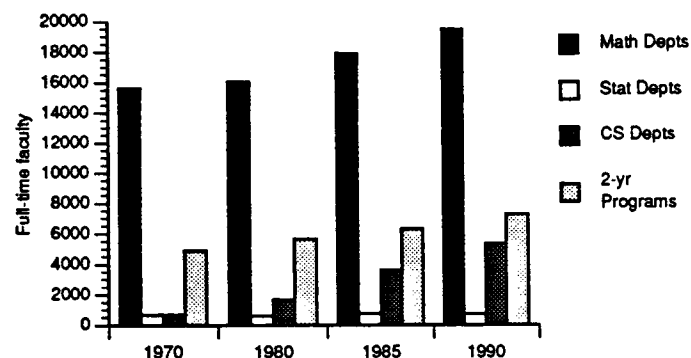


FIGURE 2. Number of full-time faculty in departments of mathematics, statistics, and computer science, and two-year college mathematics programs: fall 1970, 1980, 1985, and 1990.

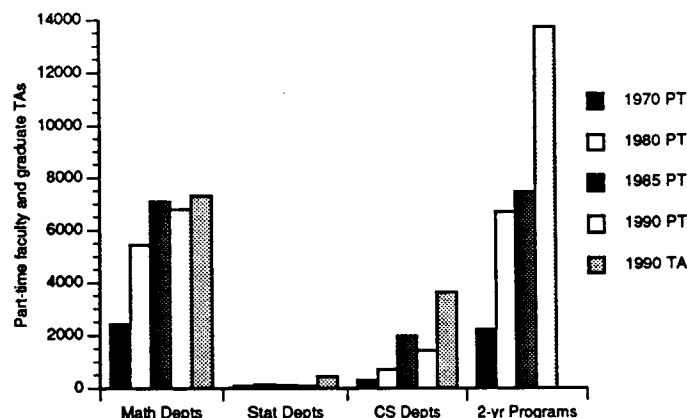


FIGURE 3. Number of part-time faculty and graduate teaching assistants in four-year college and university department of mathematics, statistics, and computer science, and two-year college mathematics programs: fall 1970, 1980, 1985, and 1990.

1992 AAAS Meeting to Offer Strong Mathematics Program

Warren Page

The annual meeting of the American Association for the Advancement of Science (AAAS), 6-11 February 1992, in Chicago, Illinois, will feature many outstanding expository talks by prominent mathematicians. The *preliminary* scientific program for 1992 lists the following symposia (three-hour sessions) and invited addresses sponsored by Section A (mathematics) of the AAAS.

- *Confidentiality in Databases*, Kathryn Chaloner, George T. Duncan, and Arjen Lenstra, organizers. (Joseph Buhler, George T. Duncan, Sallie Keller-McNulty, Mark Manasse, Sumitra Mukherjee, Elizabeth A. Unger, and Yacov Yacobi.)
- *Frontiers of Physical Sciences: 1992* will include "Self-Organization of 'Excitable' 2-D Cellular Automata," a mathematics lecture by David S. Griffeath.
- *Mathematical Modeling and Environmental Concerns*, Ben A. Fusaro, organizer. (George Carrier, Richard E. Ewing, James G. Glimm, Simon A. Levin, Robert W. McKelvey, and Charles Tier.)
- *Mathematics and Computers*, Jon Barwise and Keith J. Devlin, organizers. (Thomas F. Banchoff, Michael Freedman, Albert Marden, Clifford A. Pickover, Dana S. Scott, and Stephen Wolfram.)

- *Parallel Computing: Mathematics and Science*, Jeff Graham, Jill P. Mesirov, and Richard Schoen, organizers. (W. Daniel Hillis, Tom Leighton, Greg McRae, and James A. Sethian.)
- *Patterns and Order*, Charles Radin and Marjorie Senechal, organizers. (David S. Griffeath, Leo P. Kadanoff, Charles Radin, and Marjorie Senechal.)
- *Revolution in Undergraduate Science and Mathematics Education? The Promise of Research and Innovative Practice*, Merle Bruno, Charlene D'Avanzo, Ed Dubinsky, and Warren Page, organizers. (Charlene D'Avanzo, Thomas Dick, Ed Dubinsky, Theodore W. Ducas, James J. Kaput, Steve Monk, John Reid, and Lauret E. Savoy.)
- *Wavelets and Their Applications*, Ingrid Daubechies, Stephane Mallat, and Martin Vetterli, organizers. (R. Coifman, Ingrid Daubechies, Stephane Mallat, Howard Resnikoff, and Martin Vetterli.)

In addition, Section A of the AAAS will cosponsor various symposia that will especially interest mathematicians and mathematics educators. These symposia include: *The "Access to Algebra" Initiative* ■ *Innovation in Precollege Science and Mathematics Delivery* ■ *Pre-Columbian Science: A Modern Perspective* ■ *Presidential Awardees Make Science and Mathematics Live!* ■ *Science and Mathematics Education in Central Cities* ■ *Scientific Research in Science Education* ■ *Statistical Modeling and Analysis* ■ *Statistics Don't Lie, But . . .* ■ *Teaching Discovery-Based Physics* ■ *Whose Science and Mathematics Is It Anyway?—Multicultural Perspectives.*

The above symposia represent only a few of the approximately 150 AAAS program offerings that will broaden the perspectives of students and professionals alike. Indeed, AAAS annual meetings showcase American science and deserve greater mathematics participation. The Section A Committee seeks organizers and speakers who can present substantial new material in understandable ways. This task is not easy, but the outstanding success of the mathematics symposia at last year's AAAS annual meeting in Washington, DC proved that effort and inspiration can accomplish wonders. That year's mathematics program demonstrated that first-rate mathematical researchers can also effectively reach a broad and diverse scientific audience.

We in Section A of the AAAS know that the increasing representation and participation of mathematicians at AAAS annual meetings offer an important means for deepening public awareness and appreciation of the manifold ways that mathematics contributes to science and society. We need and welcome your suggestions for symposia topics and individuals who might organize them.

We hope that you will attend some of the exciting symposia in Chicago. For details, see the 15 November 1991 issue of *Science*. We also invite you to attend our Section A Committee Meeting, 11:30 am–1:30 pm, 9 February 1991, Wright Room, Hyatt Regency. The Committee meeting is open to all who wish to stimulate interest in and activities of the mathematical sciences within the AAAS. Please send me, and encourage your colleagues to send me, symposia proposals for future AAAS meetings: Warren Page, Department of Mathematics, New York City Technical College of The City University of New York, 300 Jay Street, Brooklyn, New York 11201 ■

Warren Page, Secretary of Section A of the AAAS, Chair of the MAA's Notes Editorial Board, and a former Second Vice President of the Association, teaches at New York City Technical College.



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MCM Winners Present Papers at Orono Mathfest

B. A Fusaro

Students from the University of Alaska at Fairbanks and Mount Saint Mary's College of Maryland made presentations at the MAA Orono, Maine Mathfest in August 1991. They were two of the six winners of the 1991 Mathematical Contest in Modeling (MCM). The contest attracted 260 undergraduate teams, a 10% increase over 1990.

The teams of three students each were presented with two realistic applied problems. They had a long weekend to choose and solve one of these problems:

PROBLEM A: ESTIMATING THE FLOW FROM A WATER TANK Communities often need data on the rate of water use but do not have the equipment to measure the flow of water in or out of the municipal tank. They measure the level of water in the tank periodically. When the level in the tank drops below some minimum level, a pump fills the tank up to a maximum level, but there is no measurement of the pump flow either. Thus, one cannot readily relate the level in the tank to the amount of water used while the pump is working, which occurs once or twice per day, for a couple of hours each time. The problem is to estimate the flow out of the tank at all times (even when the pump is working) and the total amount of water used during the day. (A table was supplied with real data from a small town, for one day.)

PROBLEM B: STEINER TREES The cost for a communication line between two stations is proportional to the length of the line. The cost for conventional minimal spanning trees of a set of n stations can often be cut by introducing "phantom" stations and then constructing a new tree, a Steiner tree. This device allows savings of up to 13.4% and never requires more than $n-2$ points to construct the cheapest Steiner tree. The first part of the problem was to construct a minimum cost Steiner tree, using rectilinear distances, for a network with nine stations. A cost $d^{(\frac{2}{3})^w}$ was then associated with each station, where d = degree of the station. The second part of the problem required a minimal cost tree for $w=1.2$. Finally, the team was asked to try to generalize.

The *Water Tank* problem was contributed by Yves Nievergelt of Eastern Washington University. The problem arose in his consulting work. The *Steiner Trees* problem was formulated by B. A. Fusaro. It was triggered by Barry A. Cipra's article, "Euclidean Geometry Alive and Well in the Computer Age," in the January 1991 issue of *SIAM News*.

There were 127 *Water Tank* solution papers, 24 of which were designated Meritorious, and 133 *Steiner Trees* solution papers, 20 of which were designated Meritorious. The judges unanimously chose three papers from each problem as outstanding enough to be published. The *Water Tank* papers were from Hiram College in Hiram, Ohio, Ripon College in Ripon, Wisconsin, and the University of Alaska at Fairbanks in Fairbanks, Alaska. The *Steiner Trees* papers were from Beloit College in Beloit, Wisconsin, Mount Saint Mary's College in Emmitsburg, Maryland, and The University of Western Ontario in London, Ontario, Canada.

The two teams that made presentations at the Orono Mathfest deserve special mention. The team from the University of Alaska at Fairbanks consists entirely of female mathematics majors. This is the first time an all-women team has emerged as a winner. Mount Saint Mary's is a small, private college that is an MCM winner for the second time. (Calvin College in Grand Rapids, Michigan also has that distinction.)

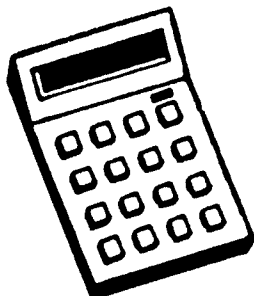
Prepare now for MCM '92. The contest will take place the weekend of **21 February 1992**. If you do not receive a registration form by **November 1991**, contact: the Consortium for Mathematics and Its Applications (COMAP), Sixty Lowell Street, Arlington, Massachusetts 02174; (617) 641-2600. ■

B. A. Fusaro of Salisbury State University is the founder of the MCM and has been its director for the last seven years. Frank R. Giordano of the US Military Academy at West Point will take over as contest director in 1992.

NSF Awards \$900,000 to Graphing Calculator Workshops

The National Science Foundation (NSF) recently awarded \$900,000 to Clemson University to fund a project to prepare 150 advanced placement readers and 50 advanced placement consultants to give graphing calculator workshops for advanced placement calculus teachers. For the next four years, at the end of this advanced placement reading on the Clemson University campus, the work-

shops will show two hundred participants how to instruct other advanced placement teachers in the effective use of graphing calculators in mathematics instruction. The participants will then give College Board workshops throughout the year and throughout the nation. Everything is sequenced to prepare the instructors of the 100,000 advanced placement students to anticipate the announced College Board interest in requiring the use of graphing calculators on the May 1995 advanced placement calculus examination.



The project will involve as its development and instructional team: Benita H. Albert, Judy E. Broadwin, John Brunsting, Franklin D. Demana, Thomas P. Dick, Walter R. Dodge, Deborah Tepper Haimo, John G. Harvey, Deborah Hughes Hallett, John W. Kenelly, Katherine P. Layton, Donald B. Small, Thomas W. Tucker, Bert K. Waits, and Paul Zorn. It will work closely with the Advanced Placement Calculus Committee and especially with the program's committee chair and chief reader—Daniel Kennedy and Raymond J. Cannon, Jr.

In addition to the assurances that the project gives to the College Board that advanced placement teachers will be able to prepare for technology-enriched instruction, the effort will impact the instruction of mathematics in two other significant ways. First, the schools will be motivated to improve their precalculus programs to prepare for significant changes in the advanced placement program. Second, as these students, with technology-enhanced secondary instruction, enter postsecondary education, they will naturally expect and be prepared to handle mathematics instruction that takes advantage of today's computers and calculators. ■

Small Planning Grants for Development of Mathematics Intervention Projects

The Mathematical Association of America (MAA) has received a grant from the Carnegie Corporation of New York to fund *Small Grants for Development of Mathematics-Based Intervention Projects*. In 1991 SUMMA made twelve small grants. SUMMA is again soliciting college and university mathematicians and their departments and institutions to submit planning proposals for the advance work necessary to host mathematics-based intervention projects for middle and high school students, targeting underrepresented minority students. These projects may replicate already existing successful projects, adapt components of such projects, or be innovative. In any case, the planned activities should include those characteristics that are known to exist in successful projects as documented in *Lessons for Historically Black Colleges and University from Precollege Mathematics and Science Programs*. The conclusion of this announcement summarizes these lessons.

OBJECTIVES Specifically the objectives of the SUMMA *Small Grants Program* are to:

- Encourage mathematicians to develop projects to increase minority participation in mathematics;
- and to provide support to project directors including the following:
- Provide funds for project directors to visit established projects;
 - Make it possible for the project director to work with the host institution to recruit faculty and in other ways develop the foundation for the project;
 - Carry out a feasibility study;
 - Provide the project director the opportunity to participate in a proposal writing workshop;
 - Secure technical assistance in proposal writing and fund raising; and
 - Make it possible for the project director to contact private foundations, public agencies, and industry for support of the project.

NATURE OF THE GRANT Grants will be \$5,000 or less and will be made to the institution of the project director to be spent within the year. To provide maximum flexibility unexpended funds may be carried forward. A letter of commitment from the appropriate administrators is required, stating that the proposer will be permitted to apply for funding from various agencies and foundations. An institution is expected to supply matching funds or in-kind support as an indication of further commitment to the development of the project. Matching funds may be release time, clerical help, etc. **While the MAA-SUMMA will fund the planning activities, it will not fund the project itself. These grants will not support any institutional indirect costs.**

WHO MAY APPLY Grants will be made to faculty at:

- Minority institutions;
- Colleges and universities which have student bodies with a high percentage of underrepresented minorities (at least 20 percent) and a track record of success in developing minority students' interest in mathematics and science; and
- Colleges and universities in which the institution or department has demonstrated that the faculty have the willingness and capacity to replicate or adapt successful projects.

EVALUATION OF PROPOSALS Proposals will be evaluated by members of the MAA Committee on Minority Participation in Mathematics, the Director of SUMMA, and the Executive Director of the MAA. The (maximum) three-page, single-spaced, proposal should include:

- **Rationale:** Why is there a need for an intervention project at your institution?
- **Objectives:** What are the objectives of your planning project?
- **Methodology:** What tasks and activities will you perform to prepare your proposal?
- **Personnel:** What is the name, position, and qualifications of the proposed project director? Who else will be involved in the planning? How?
- **Evaluation:** How will you judge the success of this planning?
- **Budget:** How will your planning funds be spent—personnel, travel, materials, telephone, workshop attendance, release time, etc?
- **Commitment:** What is the potential for long-term commitment of host institutions?
- **Future Funding:** What is the likelihood of institutionalization through local or state funding (perhaps after start-up federal funding from a variety of programs)?
- **Support:** What demonstrated ability is there to mobilize internal and community resources to sustain intervention projects?
- **Adaptation:** How might a successful existing project be adapted to your local conditions or what is the need for innovation?

SUBMISSION OF PROPOSALS Proposals should be submitted as soon as possible, but no later than **1 March 1992**. All proposers will be notified by **30 March 1992**. The MAA-SUMMA intends to make twelve to twenty grants. For additional information, contact: Dr. William A. Hawkins, Jr., Director, The Mathematical Association of America-SUMMA, 1529 Eighteenth Street Northwest, Washington, DC 20036-1385; (202) 387-5200; maa@athena.umd.edu. FAX: (202) 265-2384.

CHARACTERISTICS OF EFFECTIVE PROJECTS What has been learned? Despite the differences among current highly successful intervention projects, there are some characteristics which all effective projects targeting minority students seem to have in common. These have been identified in several reports and are synthesized in the following list of *Characteristics of Effective Precollege Intervention Projects*.

- Project goals are clearly articulated and measurable;
- Strong academic component; focus on enrichment, not remediation;
- Hands-on learning opportunities and use of computers;
- Teachers highly competent in the subject matter who believe that students can learn the material;
- Heavy emphasis on every-day applications of mathematics and on careers in the field;
- Teaching strategies that take into account the needs, socio-economic background, and cognitive development of adolescents;
- Multiyear involvement with students;
- Strong directors and a committed and stable staff;
- Involvement of staff members who look like target population;
- Stable, long-term funding based with multiple funding sources;
- Recruitment of participants from a relevant target population in a defined area;
- Involvement with universities, colleges, industries, schools, and community-based organizations;
- Parental and community support;
- Development of a peer support system;
- Evaluation, long-term follow-up, careful data collection; and
- Networking through a consortium.

SUMMA Update

S. B. Chamberlin

In late August 1990, the MAA launched SUMMA (Strengthening Underrepresented Minority Mathematics Achievement)—an ambitious, visionary, yet resolutely pragmatic enterprise dedicated to redressing the underrepresentation of minorities in mathematics. Based on the the pioneering work of the Association's Task Force on Minorities in Mathematics, the MAA's Board of Governors in 1989 committed human and financial resources towards the SUMMA program. The MAA, the Exxon Education Foundation, and the Carnegie Corporation of New York provided initial funding for the program's planning phase. Then, in May 1991, the Carnegie Corporation generously awarded a grant of \$327,000 to underwrite an expansion of SUMMA's activities. Indeed, the Carnegie grant enabled the program to realize a key component of SUMMA's long-term strategy—encouraging and supporting intervention projects for minority middle and high school students.

More than a year has passed since those early days of planning and learning. Since then, SUMMA has coordinated several informational mailings to 255 minority institutions, including 117 historically black colleges, 112 Hispanic-serving institutions, and 26 tribal colleges. It has conducted workshops during both the 1991 Annual Meeting in San Francisco, California and the 1991 Summer Meeting "Mathfest" in Orono, Maine. Workshops will also be given at the 1992 Baltimore, Maryland meeting and in twenty MAA Sections in 1991–1992. Most recently, it has distributed small planning grants to twelve institutions using the funds from the Carnegie award.

On a predictably wet Washington afternoon, Dr. William (Bill) A. Hawkins, Jr, Director of SUMMA, reflected on the past year and on SUMMA's successes and impending challenges, its original mission, and on the lessons learned through implementation of that mission. Along the entrance corridor to the SUMMA office, photographs of thirty minority mathematicians greet visitors. Behind Hawkins' desk a portrait, in cool pastels, of David Blackwell, the first black mathematician elected to the National Academy of Sciences, quietly dominates the room. Although the blinking computers are modern, the sense of history and its reverberating connections to the present pervade the office.

SUMMA's currently most visible activity is the small planning grants initiative intervention projects. These projects endeavor to facilitate and thus increase the number of mathematics enrichment programs for minority students. To date, SUMMA has identified and catalogued 67 such programs specifically designed around mathematics and conducted by mathematicians. They enroll more than 7,000 students and typically cost between \$50,000 and \$100,000 per year. The recent Carnegie grant allowed SUMMA to initiate steps to increase this number.

Towards this goal, SUMMA announced, in April 1991, grants ranging up to \$5,000 to assist institutions in a year of planning for their intervention projects. A major part of this planning involved helping the institutions to prepare and submit proposals for funding to local and national agencies.

From the thirty-seven applicants to this grants program, SUMMA made awards to: Armstrong State College in Savannah, Georgia; California State University at Los Angeles; California State University at San Marcos; Cheyney University in Cheyney, Pennsylvania; Chicago State University; Cuyahoga Community College in Cleveland, Ohio; Hampton University in Hampton, Virginia; James Madison University in Harrisonburg, Virginia; Occidental College in Los Angeles, California; Seattle University, Texas A&I University; and Villanova University in Villanova, Pennsylvania. (These include four historically black colleges and two Hispanic-serving institutions.) These institutions then began to design their programs, develop funding proposals, and identify potential sources of support.

To help further this activity, in early June 1991, SUMMA hosted a workshop at MAA headquarters in Washington, DC for grant recipients and several others who submitted proposals. During this workshop, directors of some existing programs described their operations and how the participants might adapt them to their specific needs. Manuel P. Berriozábal, Director of TexPREP at the University of Texas at San Antonio, delineated "Specific Details on How to Organize a TexPREP-Style Project." Uri Treisman of the University of California at Berkeley explored "Questions to Consider When Establishing Projects and Writing Proposals." Virginia Eaton, Acting Director of the National Science Foundation's Young Scholars Program, discussed the "Expectations of Reviewers of NSF Proposals," and Susan Gross, Coordinator of Program Monitoring for the Montgomery County Public Schools outlined the required "Evaluation and Data Base Collection." In effect, this June workshop communicated the experience and savvy characteristic of successful grant proposals.

Similar, existing programs have received support from the Young Scholars Program of the National Science Foundation, NASA, the Department of Energy, and the Department of Education's Minority Science Improvement Program, and Eisenhower Mathematics and Science Programs. SUMMA advised these twelve institutions through the process of transforming a promising idea into a functioning program and project.

Although the twelve projects vary in focus, they all share some common features. All will include summer sessions as well as academic year sessions. All seek to involve at least fifty students. In projects at the middle school level all of the students are minorities. At the high school level they will reflect the demographics of the geographic area from which the students are drawn. All focus on enrichment and cannot be remedial. Hawkins explains that "the main focus of the projects should be enrichment. They do not have to be exclusively mathematics-oriented; they may be a mixture of mathematics and science. They involve a career activity that includes visitors, mentors, films, visits to industries—an emphasis on showing students in grades 6 through 12 what scientists and mathematicians actually do and how to get there."

Hawkins further describes these intervention projects as in part concerned with the mathematics pipeline. He portrays the students enrolled in such projects as "high-potential or high-achieving; kids that have shown some achievement in their science and math courses, but who might fall away if you don't work with them." To attract these students, intervention programs offer "topics you don't necessarily get in a standard curriculum—number theory, applications of mathematics in biology, group theory, logic, pattern recognition, probability and statistics, spatial visualization. We encourage people to make things more concrete rather than abstract. They need something that makes mathematics even more appealing, that supplements their existing curriculum. They need something to 'light the fire' of interest."

Through enrichment, these intervention programs can capture and sustain students' enthusiasm for mathematics. This enthusiasm can encourage them to continue in their study of mathematics and, thus, "augment the pool of mathematically qualified minority students". Hawkins elaborates on this sequence. "Another aspect of the programs is that we really want kids to be at a college campus so that they become inclined to think of themselves as college material. A College Board study (*Changing the Odds*) on factors that affect college participation for minority students found that students who want to go to college and who take algebra and geometry and other general college requirements go to college at about the same rate across all ethnic groups. What we are trying to do is create programs that will help students to move onto that college-prep track."

By spring 1992, these promising twelve programs will learn if their proposals have successfully secured funding. Those which do receive funding will implement their programs during the summer of 1992. Hawkins is optimistic about the future. As word arrives of this first round of funding proposals, other institutions will have just submitted applications by 1 March 1992 for the second round. As the numbers of operating programs grow, SUMMA will collect data concerning their characteristics and achievements. SUMMA's goal is to establish, over two years, a minimum of twenty, sustained programs. Hawkins stresses that "existing programs have proved extraordinarily effective in realizing change for minorities and mathematics." The care and dedication SUMMA has devoted to its first twelve grant recipients give every indication that these too will achieve impressive results.

In the year ahead, SUMMA is looking forward to initiating steps to network these various mathematics-based intervention projects, establishing pilot projects for mentoring minority students in mathematics, conducting a study on recruiting and retaining minority teachers in mathematics, beginning initiatives on mainstreaming minorities at two-year colleges in collaboration with the American Mathematical Association of Two-Year Colleges (AMATYC), and exploring plans for networking mathematics departments at minority-serving institutions. ■

The College Mathematics Journal Special Issue on Linear Algebra

The January 1993 issue of *The College Mathematics Journal* will be devoted entirely to the teaching of introductory linear algebra. We are looking for articles that describe fresh approaches to the subject, such as:

- presenting fundamental concepts in new ways;
- introducing new applications;
- using computers;
- creating student projects; and
- shifting the focus of the course from abstract vector spaces to concrete matrices.

The Board of Editors invites you to submit a paper for this special issue. We welcome articles for all of the regular sections: main articles, classroom capsules, student research projects, fallacies, classroom computer capsules, media highlights, and quotes or short ideas.

All submissions will be refereed. Please send five photocopies of your manuscript to either: Ann E. Watkins or William E. Watkins, Editor, *The College Mathematics Journal*, Department of Mathematics, California State University at Northridge, Northridge, California 91330.

Papers intended for one of the regular sections of *The College Mathematics Journal* may be sent directly to the section editor. Papers should be in the editor's hands by **31 January 1992**. ■

Undergraduate Research Experiences

The Center for Discrete Mathematics and Theoretical Computer Science (DIMACS), a consortium of Princeton and Rutgers Universities, AT&T Bell Laboratories, and Bellcore, anticipates funding from the National Science Foundation for a *Research Experience for Undergraduates* (REU), which will be held on the campus of Rutgers University from 22 June–14 August 1992. Twenty current undergraduates (juniors and well-qualified sophomores) will be selected to work with experienced researchers on problems in cooperative game theory, combinatorial search, discrete optimization, interior point methods, algorithms, computational geometry, bio-computing, and neural networks. Participants will receive a \$2,000 stipend and free on campus housing. For additional information and application forms, contact: DIMACS Center REU, Rutgers University, PO Box 1179, Piscataway, New Jersey 08855-1179; ?@dimacs.rutgers.edu. Direct any questions concerning the program to: David Housman, Department of Mathematics and Computer Science, Drew University, Madison, New Jersey 07940; dhousman@drew.bitnet. ■

The MAA is seeking nominations for Treasurer to fill the unexpired term of Donald L. Kreider, who has been elected to serve for one year as President-Elect before succeeding Deborah Tepper Haimo as President. Names of all candidates to be considered should be sent to: MAA Secretary Gerald L. Alexanderson, Department of Mathematics, Santa Clara University, Santa Clara, California 95053. Please include with your nomination as much relevant information as possible about the candidate. ■

1992 Summer Mathematics Institutes for Women and Minorities

University of California at Berkeley Fourth Annual Intensive Mathematics Program for Underrepresented Minority Undergraduates

In an effort to increase the number of underrepresented minority students seeking careers requiring a PhD degree in the mathematical sciences, the University of California at Berkeley will offer a residential summer research program for approximately thirty undergraduate students, **15 June 1992–24 July 1992**. The program is being organized by Uri Treisman of the University of Texas at Austin and the Dana Center for Mathematics Education at the University of California at Berkeley, and by Leon A. Henkin of the University of California at Berkeley and Mills College. Funding for the program is being sought from the National Science Foundation (NSF).

Faculty are asked to seek out candidates for the program and encourage them to apply. The program targets underrepresented minority students (US citizens or permanent resident status): African-American, American Indian, Latino, Mexican-American/Chicano, Native Alaskan (Eskimo or Aleut), Native Pacific Islander (Polynesian or Micronesian), and Puerto Rican undergraduates.

Mills College Second Annual Intensive Mathematics Program for Women Undergraduates

In an effort to increase the number of women of all ethnicities seeking careers requiring a PhD degree in the mathematical sciences, Mills College will offer a residential summer research program for approximately twenty-four women undergraduates, **15 June–24 July 1992**. The program is being organized by Leon Henkin of the University of California at Berkeley and Mills College, and by Lenore Blum of Mills College and the International Computer Science Institute. Funding for this program is being sought from the National Science Foundation (NSF).

Faculty are asked to seek out women students of all ethnicities who could benefit from the Mills College Summer Mathematics Institute and encourage them to apply.

PROGRAM DESCRIPTION The summer institutes of both the University of California at Berkeley and Mills College seek students who have completed *with distinction* at least one year of collegiate mathematics beyond freshman calculus by June 1992. Each student selected to participate will receive room and board, a \$2,000 stipend, and the cost of transportation to and from the institute.

Students will explore in depth two areas of mathematics. Part of this exploration will take place in seminars consisting of about twelve students each and taught by active senior research mathematicians. Seminar students will then be encouraged to tackle challenging problems individually, in small groups, and in consultation with graduate student mentors. In addition, there will be weekly colloquia designed to provide participants with a broad view of current work in mathematics, as well as of career opportunities for mathematicians.

Projected application deadline for both summer institutes is **21 February 1992**. For additional information and application forms for the Summer Mathematics Institute at the University of California at Berkeley, contact: the University of California at Berkeley, 1992 Summer Mathematics Institute, PDP 230B Stephens Hall, Berkeley, California 94720; (510) 642-5881. For additional information and application forms for the Summer Mathematics Institute at Mills College, contact: Summer Mathematics Institute, c/o Mills College, Oakland, California 94613; (510) 430-2226. If you are eligible for both the Mills College and the University of California at Berkeley Summer Institutes, obtain an application form from the University of California at Berkeley and state your program preference.

1992 Annual Meeting Updates

Carolyn Mahoney of California State University at San Marcos will deliver the **Second Annual Student Chapters Lecture**, *Contemporary Problems in Graph Theory*, on Friday, 10 January 1992 at 7:30 pm. The lecture is sponsored by the Committee on Student Chapters and the Committee on Minority Participation in Mathematics.

Educational Mathematics PhD Program. Drop by Room 304 of the Hyatt Regency Hotel between 8:00 am and 10:55 am, on Friday, 10 January 1992, to talk with Richard Grassl and Igor Szczyrba about this unique program at the University of Northern Colorado. The program was designed jointly by mathematicians and mathematics educators and uniquely combines a broad range of graduate courses in mathematics with meaningful educational

seminars and culminates in a thesis that studies, in particular, the impact of advanced mathematical content on the teaching of mathematics at lower levels.

Poetry Readings and Calculus-Art Presentation: A general poetry reading is scheduled from 7:00 pm to 10:00 pm on Friday, 10 January 1992. This reading has been organized by JoAnne Growney, Dan Kalman, and Elena Marchisotto. From 1:00 pm to 2:00 pm on Saturday, there will be a special presentation entitled *The Calculus Virgin*. Louis Leithold, mathematician, and artist-poet d'Arcy Hayman will discuss an artist's view of the language of calculus and show drawings which are d'Arcy Hayman's passionate and thrilling response to Louis Leithold's seminar on calculus for teachers of Advanced Placement calculus. These readings are sponsored by the Humanistic Mathematics Network (Alvin White).

FIXED POINTS

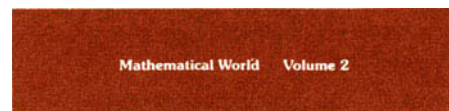
Yu A. Shashkin

(AMS-MAA Mathematical World Series, Volume 2)

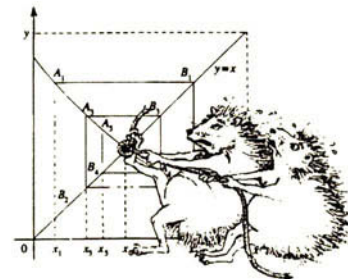
The theory of fixed points finds its roots in the work of Poincaré, Brouwer, and Sperner and makes extensive use of such topological notions as continuity, compactness, homotopy, and the degree of a mapping. Fixed point theorems have numerous applications in mathematics; most of the theorems ensuring the existence of solutions for differential, integral, operator, or other equations can be reduced to fixed point theorems. In addition, these theorems are used in such areas as mathematical economics and game theory.

This book presents a readable exposition of fixed point theory. The author focuses on the problem of whether a closed interval, square, disk, or sphere has the fixed point property. Another aim of the book is to show how fixed point theory uses combinatorial ideas related to decomposition (triangulation) of figures into distinct parts called faces (simplexes), which adjoin each other in a regular fashion. All necessary background concepts—such as continuity, compactness, degree of a map, and so on—are explained, making the book accessible even to students at the high school level. In addition, the book contains exercises and descriptions of applications. Readers will appreciate this book for its lucid presentation of this fundamental mathematical topic.

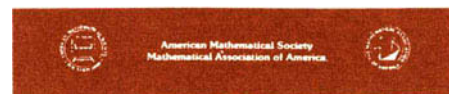
1991, Paperbound, 88 pp.
List: \$24.00; MAA Member: \$19.00
Catalog Number: FIX



Fixed Points



Yu. A. Shashkin



The Mathematical Association of America
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1991 Annual AMS-MAA Survey (First Report)

Highlights from the 1991 Survey of New Doctorates



The Job Market



Faculty Salaries

The latest annual AMS-MAA survey of the profession has just been released. The full report was printed in the November 1991 issue of the AMS NOTICES. Copies may be obtained, at no cost, from: Monica Foulkes, American Mathematical Society, PO Box 6248, Providence, Rhode Island 02940. This FOCUS report presents just a summary of the survey.

Descriptions of Groups

For these survey reports, departments are divided into groups according to the highest degree offered in the mathematical sciences:

Groups I and II include the leading departments of mathematics in the US according to the 1982 assessment of Research-Doctorate Programs conducted by the Conference Board of Associated Research Councils in which departments were rated according to the quality of their graduate faculty.¹

Group I is composed of 39 departments with scores in the 3.0–5.0 range.

Group II is composed of 43 departments with scores in the 2.0–2.9 range.

Group III contains the remaining US departments reporting a doctoral program.

Group IV contains US departments (or programs) of statistics, biostatistics, and biometrics reporting a doctoral program.

Group V contains US departments (or programs) of applied mathematics-applied science, operations research, and management science which report a doctoral program.

Group Va is applied mathematics-applied science;

Group Vb is operations research and management science.

Group VI contains doctorate-granting departments (or programs) in the mathematical sciences in Canadian universities.

Group M contains US departments granting a master's degree as the highest graduate degree.

Group B contains US departments granting a baccalaureate degree only.

¹These findings were published in *An Assessment of Research-Doctorate Programs in the United States: Mathematical and Physical Sciences*, edited by Lyle V. Jones, Gardner Lindzey, and Porter E. Coggshall, National Academy Press, Washington, DC, 1982. The information on mathematics, statistics, and computer science was presented in digest form in the April 1983 issue of *Notices*, pages 257–267, and an analysis of the above classifications was given in the June 1983 *Notices*, pages 392–393. For a listing of departments in Groups I and II, see the April 1988 *Notices*, page 532–533.

The main conclusions to be drawn from the survey are:

- US institutions awarded 1,074 doctorates in the mathematical sciences from 1 July 1990 to 30 June 1991, an increase of 15 percent over last year's fall count and 26 percent more than the average of the fall counts for the last four years.
- The number of US citizens reported to have received doctorates in the mathematical sciences is 461, which is 15 percent higher than the number earning doctorates last year and 27 percent higher than the record lows recorded in 1986–1987 and 1987–1988.
- The number of non-US citizens receiving doctorates in the mathematical sciences reached a new high of 600, well over twice the number of noncitizens earning doctorates in the US ten years ago. (Citizenship information was not available for all new doctorates at the time of this writing.)
- Of the 461 US citizen doctorates, 10 are black. In 1989–1990 only 4 of the US citizen doctorates were black.
- Total employment of new doctorates in the US increased from last year, but employment in some sectors decreased and the percentage of unemployed increased substantially. As of late September 1991, approximately 12 percent of the new doctorates were reported to be still seeking employment. The percentage unemployed is over twice the corresponding percentage reported last fall.
- The total number and the percentage of women among US citizen new doctorates reached new highs in 1990–1991. A total of 112 US citizen women earned doctorates from US universities, accounting for 24 percent of the doctorates awarded to US citizens.
- The median starting salary of new doctorates reporting teaching (or teaching and research) was \$33,000 for men and \$33,200 for women.
- In almost all cases, the mean salary by faculty rank reported for 1991–1992 increased less than 5 percent over that reported for 1990–1991. Major exceptions were the 1991–1992 mean salaries reported for associate and full professors in doctorate-granting departments of applied mathematics and operations research (Group V), which increased 9 percent and 7 percent, respectively.

The Job Market

Most new doctorates accept academic positions. Of the 704 new doctorates employed in the US, a total of 564 (80 percent) hold jobs in academia. For comparison, last year's *First Report* showed 678 new doctorates employed in the US, including 571 in academic positions. The 564 academic positions this year include a total of 247 in US doctorate-granting departments (Groups I–V). This number is only slightly smaller than last year (259 positions in Groups I–V) and remains above the corresponding numbers in the previous two years (240 in 1988–1989 and 207 in 1987–1988). Among these Groups, the number hired by Group I has been essentially constant for three years. The numbers hired by Group II and Group III both declined by 9 (-20 percent and -14 percent, respectively). The number of new doctorates employed by bachelor's degree-granting colleges and universities increased by 20 (19 percent) from 1989–1990.

Group I	39 of 39
Group II	42 of 43 including 3 with 0 degrees
Group III	80 of 86 including 27 with 0 degrees
Group IV	53 of 75 including 5 with 0 degrees
Group Va	12 of 16
Group Vb	18 of 33
Group VI	27 of 31 including 8 with 0 degrees

Table 1. Response Rates

	86–87	87–88	88–89	89–90	90–91
U.S.	779	804	905	933	1074
Canada	66	52	53	58	68
Total	845	856	958	991	1142

Table 2. New Doctorates, Fall Counts

Excluding those whose employment status is unknown, 22 percent of the women and 25 percent of the men accepted appointments in Groups I–V departments.

The number of new doctorates taking jobs in US nonacademic positions increased significantly this year. The 140 positions in government, business, and industry in the US account for 20 percent of total US employment. Last year at this time, the total of 107 US nonacademic positions represented 16 percent of the US total.

A striking change has occurred in the numbers shown as "not yet employed" in Tables 3A and 3B. Of those whose employment status is known, over 12 percent are unemployed. At the same time last year, 5.7 percent of the 1989–1990 new doctorates were reported as "not yet employed." The data in Table 3A were obtained (*AMS-MAA Survey continues on page twelve.*)

Table 3A: Employment Status of 1990–1991 New Doctorates in the Mathematical Sciences

Type of Employer	Algebra or Number Theory	Real or Complex Analysis	Geometry or Topology	Logic	Probability or Statistics	Applied Mathematics	Discrete Math or Combinatorics	Numerical Analysis	Linear or Non-linear Optimization	Other	TOTAL
Group I	21	18	31	3	5	14	1	2	1	4	100
Group II	5	8	5		2	10	1	4	1	1	37
Group III	9	8	11		9	9	4	1	1	2	54
Group IV					37	2					39
Group V					5	7	1	2	1	1	17
Masters	18	12	7		15	9	7	3	2	6	79
Bachelors	17	17	27	2	14	18	6	5	1	18	125
Two-year Colleges	4	2	1		1	7				3	18
Other Academic Departments	3	1	1	3	17	14	2	2	2	17	62
Research Institutes	5	3	4		9	4			1	7	33
Government		2			7	10	2	1		2	24
Business and Industry	5	3	6	2	55	10	4	4	13	14	116
Canada, Academic	11	3	8		6	11	4	1	1	8	53
Canada, Nonacademic											
Foreign, Academic	14		10	3	28	11	1	2	4	11	104
Foreign, Nonacademic		1			4	1	1			3	10
Not seeking employment		1	1		4		1	3		3	13
Not yet employed	14	17	17	3	25	23	11	4	1	10	125
Unknown (U.S.)	3	4	2		4	8		2	2	7	32
Unknown (non-U.S.)*	19	16	21	4	14	11	4	4	3	5	101
Total	148	136	152	20	261	179	50	40	34	122	1142

*Non-U.S. citizens who returned to their country of citizenship and whose status is reported as "unknown" or "still seeking employment".

(AMS-MAA Survey continued from page eleven.)

in many instances early in the summer of 1991 and do not reflect subsequent hiring. Nonetheless, the year-to-year comparison shows compelling evidence of the difficult job market faced by this year's new doctorates. An update of Table 3A is planned for the *Second Report* in a spring 1992 issue of *Notices*. In a similar update last year, the percentage of 1989–1990 new doctorates who had reported not finding employment was 2 percent (see *Notices*, November 1990, page 1219, and May–June 1991, page 413).

The 1991 Survey sent to individual new doctorates asked for information about the type of academic position held. Based on an early response from 377 individuals who provided information about their contract terms, 50 percent reported their positions are not tenure-eligible and 50 percent reported that their positions are tenured or tenure-eligible. The respondents include holders of academic positions everywhere, not exclusively within the US.

Table 3C shows employment status, by type of employer and Group of the department granting the degree, of the 1,142 new doctorates. (The 1,142 includes both 68 Canadian doctorates and 1,074 US doctorates.) The results document patterns generally recognized anecdotally. For example, Table 3C shows that 85 percent of the new doctorates obtaining academic positions in Group I departments obtained their degrees from Group I departments. Similarly, 85 percent of the new doctorates taking positions in Group IV departments obtained their degrees from Group IV departments. New doctorates from Group IV or Group V departments assume

US nonacademic positions in greater proportion than new doctorates from Groups I–V overall. The unemployment rates are different for each group. Excluding those whose employment status is unknown, the percentages who are reported to be still seeking employment are 10.8 percent for Group I, 17.2 percent for Group II, 15.0 percent for Group III, 6.0 percent for Group IV, 8.6 percent for Group V, and 28.6 percent for Group VI (Canadian departments).

Table 3D shows the pattern of employment within broad job categories broken down by citizenship status for those new doctorates earned from US universities (Groups I–V). The citizenship status is known for 1,029 of 1,074 recipients of doctorates from US institutions. The rate of unemployment is slightly higher for non-US citizens (12.2 percent of those whose job status is known) than it is for US citizens (10.4 percent). Understandably, a much higher percentage of the noncitizens are found in foreign academic positions. The percentage of US citizens in US nonacademic jobs is much higher than the percentage of noncitizens in the same category (18.2 percent of citizens versus 11.3 percent of noncitizens whose job status is known). US citizens hold positions in US academic doctorate-granting departments in lower proportion than do noncitizens (22.7 percent of citizens compared to 28.4 percent of noncitizens), while citizens hold positions in non doctorate-granting US departments in substantially higher proportion than do noncitizens (41.0 percent of citizens compared to 20.6 percent of noncitizens); here all percentages exclude new doctorates whose job status is unknown.

**Table 3B: Employment Status of 1990–1991 New Doctorates in the Mathematical Sciences
Females Only**

Type of Employer	Algebra or Number Theory	Real or Complex Analysis	Geometry or Topology	Logic	Probability or Statistics	Applied Mathematics	Discrete Math or Combinatorics	Numerical Analysis	Linear or Non-linear Optimization	Other	TOTAL
Group I	3	4	3	1	1	2				1	15
Group II		3	1		1	2		1	1		9
Group III	2		1		2	3					8
Group IV					9						9
Group V					3						3
Masters	6	1	1		4	1	2				15
Bachelors	8	5	12		3	3	1	2		3	37
Two-year Colleges	1					2					3
Other Academic Departments	1	1			5	2	1	1	1	6	18
Research Institutes					2					3	5
Government					2		1			1	4
Business and Industry		1			16	3		1	3	2	26
Canada, Academic					1		1		1	1	4
Canada, Nonacademic											
Foreign, Academic	2	3		1	9	2		1		3	21
Foreign, Nonacademic											
Not seeking employment					1			1			2
Not yet employed	2		4	1	7	6	2				22
Unknown (U.S.)					1					3	4
Unknown (non-U.S.)*	3	3	6	1	3	3	1			2	22
Total	28	21	28	4	70	29	9	7	6	25	227

*Non-U.S. citizens who returned to their country of citizenship and whose status is reported as "unknown" or "still seeking employment".

**TABLE 3C: Employment Status of 1990–1991 New Doctorates
by type of granting department**

TYPE OF EMPLOYER	TYPE OF DOCTORATE-GRANTING DEPARTMENT						TOTAL EMPLOYED BY TYPE OF EMPLOYER
	Group I Math	Group II Math	Group III Math	Group IV Statistics	Group V Applied Math/OR	Group VI Canada	
Group I	85	7	1	2	3	2	100
Group II	18	9	3	1	6		37
Group III	29	8	10	6	1		54
Group IV		2	3	33	1		39
Group V	1	2	1		13		17
Masters	24	22	16	12	5		79
Bachelors	39	37	38	4	7		125
Two-year Colleges	3	4	9	1	1		18
Other Academic Departments	20	5	3	14	20		62
Research Institutes	14	2	1	9	6	1	33
Government	5	3	3	4	8	1	24
Business and Industry	15	15	11	39	36		116
Canada, Academic	16	4	2	2		29	53
Canada, Nonacademic							
Foreign, Academic	47	16	6	21	7	7	104
Foreign, Nonacademic	2	2		3	3		10
Not seeking employment	3	6	1	3			13
Not yet employed	39	30	19	10	11	16	125
Unknown (U.S.)	10	3	3		16		32
Unknown (non-U.S.)*	56	8	6	6	13	12	101
TOTALS	426	185	136	170	157	68	1142

*Non-U.S. citizens who returned to their country of citizenship and whose status is reported as "unknown" or "still seeking employment".

**TABLE 3D: Employment Status of 1990–1991 U. S. New Doctorates (Groups I–V)
by citizenship status***

TYPE OF EMPLOYER	TYPE OF CITIZENSHIP				TOTAL DOCTORATES WHOSE CITIZENSHIP IS KNOWN*	
	U.S. Citizens		Non-U.S. Citizens		Number	Percent
	Number	Percent	Number	Percent		
U.S. Academic, Ph.D. Department	96	21	149	26	245	24
U.S. Academic, non-Ph.D. Department	173	38	108	19	281	27
U.S. Research Institute	16	4	16	3	32	3
U.S. Nonacademic	77	17	59	10	136	13
Foreign Academic	12	3	109	19	121	12
Foreign Nonacademic			10	2	10	1
Not seeking employment	4	1	9	2	13	1
Unemployed and seeking employment	44	10	64	11	108	10
Unknown status (U.S. address)	28	6	4	1	32	3
Unknown status (foreign address)			51	9	51	5
TOTALS	450	100%	579	100%**	1029	100%**

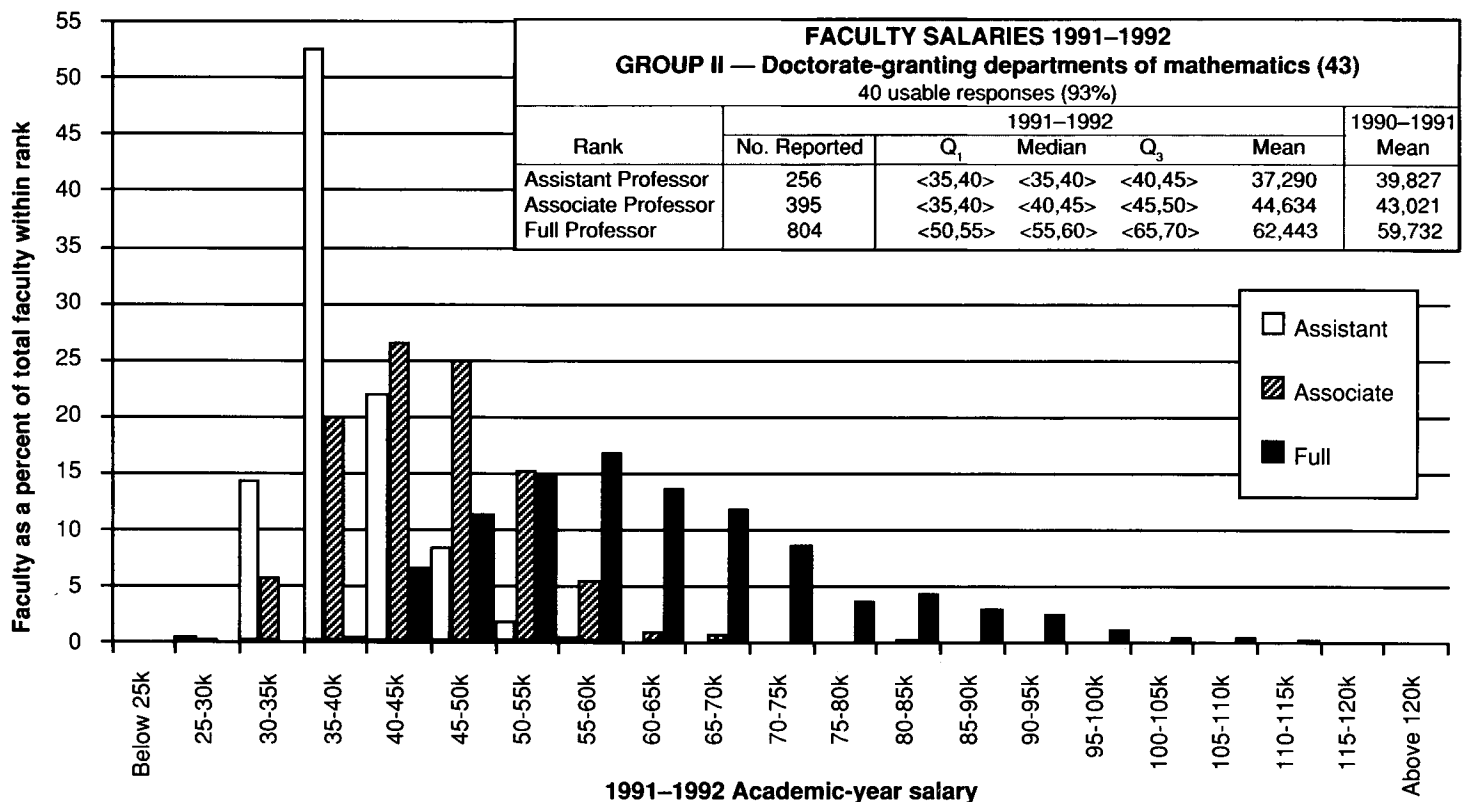
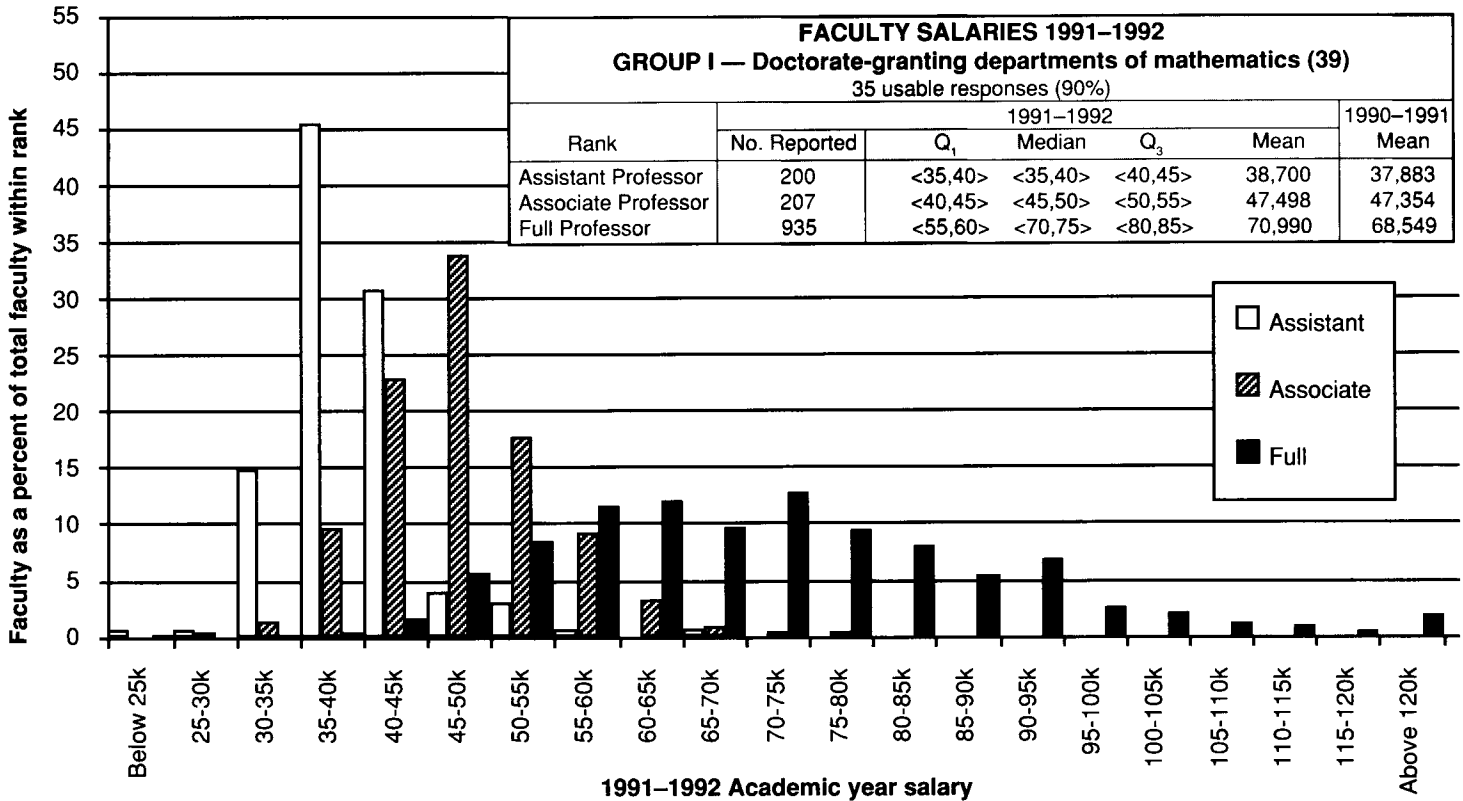
* The adjusted total varies from that on Table 5 because the data are gathered on different surveys.

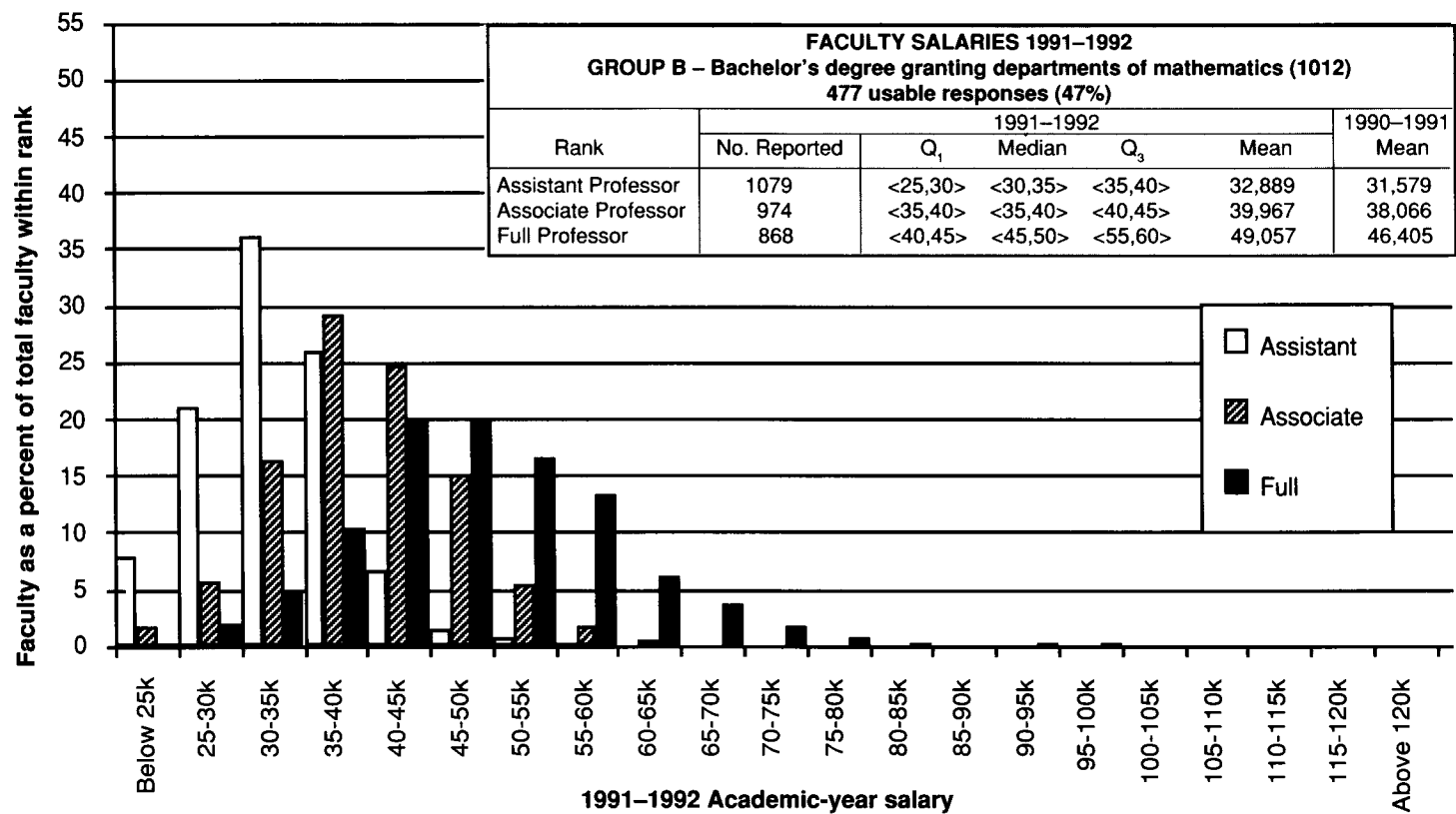
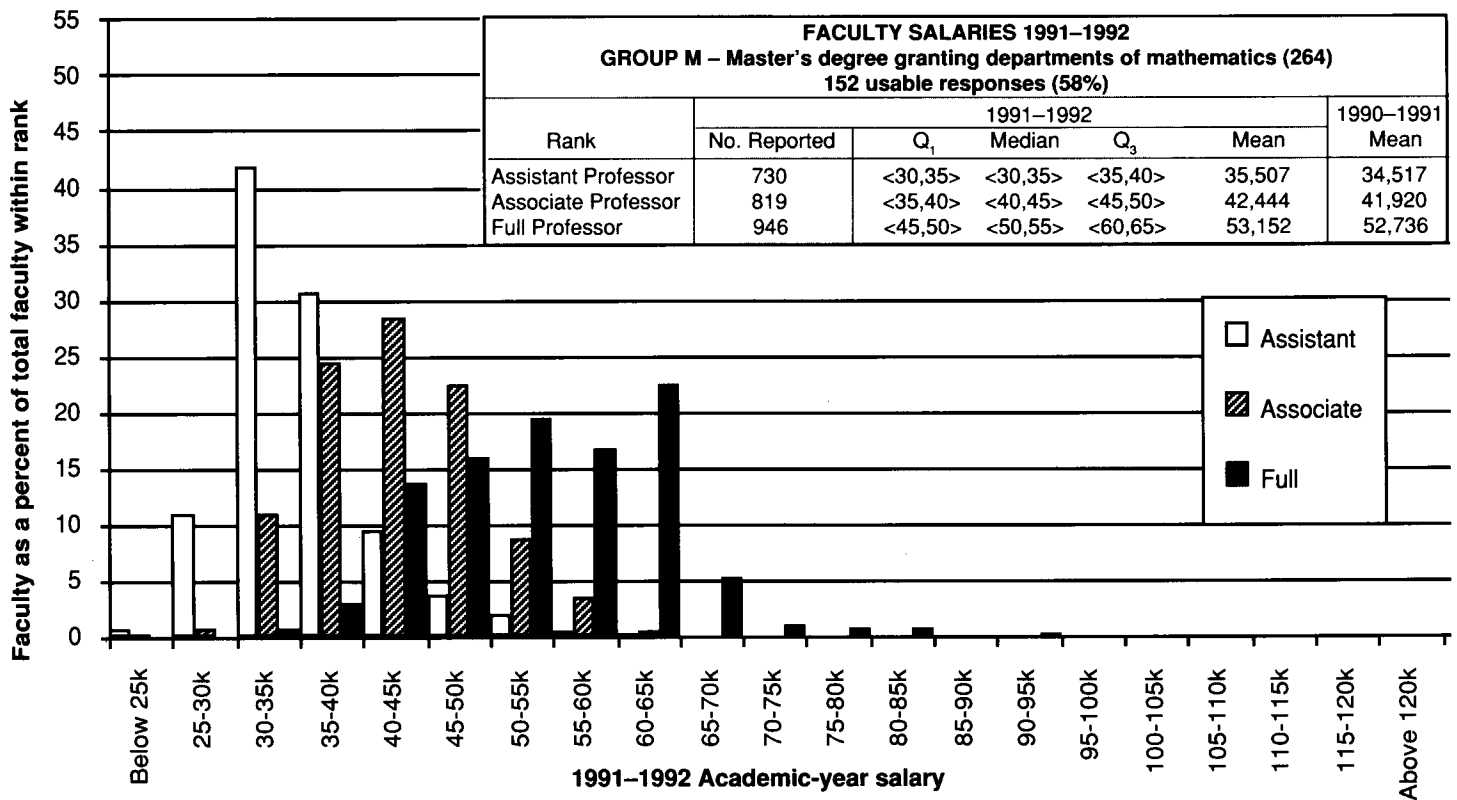
** Column percents are rounded to the nearest whole percent.

Faculty Salaries

The following charts display faculty salary data for Groups I, II, M and B: faculty salary distribution by rank, mean salaries by rank, information on quartiles by rank, and the number of usable returns for the group. The full report gives similar charts for all groups. Departments were asked to report the number of faculty whose 1991–1992 academic-year salaries fell within given salary inter-

vals. Reporting salary data in this fashion eliminates some of the concerns about confidentiality, but does not permit determination of actual quartiles. What can be determined is the salary interval in which the quartiles occur, and this information has been added to this year's report. The salary intervals containing the quartiles are denoted by $\langle n, n + 5 \rangle$.





Educational Research: Insight or Jargon?

Lynn Arthur Steen

Can research on collegiate mathematics education improve teaching and learning in colleges and universities? Some say "yes," others "no"; some say "perhaps," others "not likely." Advocates of various views gathered recently in Washington, DC, one week after adjournment of the Madrid peace talks, to meet and talk face-to-face across a large conference table. They left Washington agreeing not only to continue talking, but also to urge action on a number of important recommendations.

The meeting, convened by the MAA with support from the National Science Foundation (NSF), focused on four aspects of research in college-level mathematics education:

1. Communicating to college and university faculty the growing body of such research.
2. Improving student learning by changes in collegiate teaching that are based on findings of this research.
3. Encouraging high standards in research in college-level mathematics education.
4. Supporting the increasing number of college and university faculty who conduct research in undergraduate mathematics education.

As one would expect, views of those who attended the conference varied considerably. For some, mounting problems in undergraduate mathematics provided a sense of urgency for research that would be helpful in addressing these problems. Others who shared this sense of urgency about improving undergraduate mathematics were openly skeptical that educational research could be an effective engine of constructive change in the way mathematics is taught in colleges and universities. Still others, viewing research in collegiate mathematics education as an important aspect of basic research, cautioned against any claim of immediate applicability to current problems.

Among the skeptics two groups emerged: those who were not persuaded of the quality or utility of research findings in a field that is perceived by many mathematicians as filled with jargon-laden banalities; and those who believe that mathematicians would not be motivated to change their habits no matter how compelling the research results may be.

Advocates for strengthening research in undergraduate mathematics education argue as follows: First, a well-established professional community of individuals who carry out research in school mathematics education have produced findings that bear directly on college-level mathematics education. Second, the growing number of individuals engaged in similar work at the college level requires scholarly support structures to ensure the vitality of their field. And finally, research in learning and teaching is an essential component of (perhaps even a prerequisite to) projects that seek to improve undergraduate mathematics.

Despite the very different motivations of individuals who debated these issues, conferees did reach consensus on a variety of statements and recommendations:

- A journal on research in collegiate mathematics education is an important means of strengthening professional standards, of encouraging quality research, and of supporting individuals engaged in this type of scholarly work. A major goal of such a journal should be to achieve sufficient stature to command respect among the broad community of mathematicians and mathematics educators. Ideally, such a journal should be jointly sponsored by several mathematics societies, including both the MAA and the American Mathematical Society (AMS).
- The MAA and AMS, in cooperation with the National Council of Teachers of Mathematics (NCTM), should plan a series of annual special volumes presenting exemplary research papers in collegiate mathematics education as a precursor to a possible journal.
- Editors of MAA and AMS periodicals should solicit substantial review or survey articles to appear simultaneously with publication of

the annual volumes to stimulate interest among mathematicians in issues addressed in these research volumes.

- The MAA and AMS should investigate and develop as rapidly as possible appropriate mechanisms for electronic exchange of information among individuals engaged in research on undergraduate mathematics education, and between this community of researchers and those who teach college and university mathematics. In particular, part of this investigation should include exploration of the possibility of establishing an electronic journal on undergraduate mathematics education.
- Editors of journals and periodicals that are read by college and university mathematicians should provide regular information on research in undergraduate mathematics education through such means as brief "telegraphic" reviews of research papers and special survey articles or issue papers dealing with the application of educational research to the improvement of learning.
- The MAA and AMS, in cooperation with the NCTM, should plan special conferences or sessions at national, regional, or Sectional meetings dealing with aspects of research in collegiate mathematics education. These activities should be designed to expand the interface between educational researchers and mathematicians. Other meetings could be designed to promote scholarly exchange among those engaged in research in collegiate mathematics education or for the purpose of setting a research agenda and attracting newcomers to take up important issues in the field.
- The mathematics professional societies should identify and publicize in mainstream mathematics journals strategies that have been effective in stimulating and institutionalizing improved mathematics instruction. Examples include university centers for teaching and learning as well as departmental seminars on curriculum and teaching.
- The MAA and AMS should identify and disseminate lists of individuals who would be prepared to speak on issues of research in undergraduate mathematics education. These lists could be sent to departments as suggestions for colloquium speakers and to program planning committees for Sectional, regional, and national meetings.
- The newly formed Joint Policy Board for Mathematics (JPBM) committee on rewards and values in university mathematics departments should seek to identify and disseminate effective evaluation and reward mechanisms that can promote high standards in professional activities in mathematics education. In particular, their agenda should address those individuals whose professional work is devoted to research in mathematics education, as well as those whose work centers on curriculum development or educational practice.
- The MAA and AMS, in conjunction with the American Mathematical Association of Two-Year Colleges (AMATYC), should undertake a study of the effects of the increasing reliance on part-time faculty for mathematics instruction, especially to determine if part-time faculty differ from full-time faculty in their approaches to teaching.

To make all this happen, the conference report will likely recommend that the MAA and AMS establish a joint committee on Research in Teaching and Learning of Collegiate Mathematics. Even though conferees disagreed about the objectives of the conference and the means for achieving them, they did agree that to achieve any objectives at all, both the MAA and AMS must provide both visible and active leadership. ■

Lynn Arthur Steen, Professor of Mathematics at St. Olaf College in Northfield, Minnesota, chairs the MAA's Committee on the Undergraduate Program in Mathematics (CUPM). He is an Associate Editor of the AMERICAN MATHEMATICAL MONTHLY and, in 1985-1986, served as the Association's forty-first President.

FOCUS EDITORIAL

Early this year, the MAA's Committee on the Participation of Women in Mathematics produced a book entitled *Winning Women into Mathematics*, which is aimed primarily at those in the profession rather than entrants. *Winning Women into Mathematics* was the first of three new publications dealing with gender issues in mathematics to appear in 1991, and it has been selling at a brisk clip. Since its publication, both the Association for Women in Mathematics (AWM) and the American Mathematical Society (AMS) have produced special publications highlighting women in mathematics.

Careers That Count is the title of a brochure published recently by the AWM. It consists of profiles of fifteen professional mathematicians, sixteen if you include AMS *Notices* staff-writer Allyn Jackson, who wrote the articles in this brochure. It is beautifully produced, on glossy paper, with a three-color format inside, and a full-color cover. Every profile is accompanied by a photograph. The subjects range over the whole spectrum of mathematical professions, from university research to schoolteaching, from industry to government, from finance to medical research.

It is a brochure that should be in every high school, in every college coffee room used by students, and on every career-advisor's desk. Produced by the AWM, and with every one of the fifteen mathematicians profiled a woman, it is clear that the brochure is intended to try to counter some well-known stereotypes and to make women students more aware of the opportunities available to them in the mathematical sciences. But in fact none of the facts you will find inside the booklet has anything to do with gender. Every article could equally have been structured around a male mathematician. This is a publication aimed at all students and their teachers. The contents are applicable to all, which makes the gender message all the more powerful.

And if anyone thinks there is not a gender issue in mathematics, they should take a look at the September AMS *Notices*, a special issue devoted to women in mathematics. A number of women mathematicians describe their own experiences in a field dominated by males. The article by Jenny Harrison describes some particularly worrying episodes, such as the professor who said he would not act as one student's advisor unless they became sexually intimate, or the visiting professor at Warwick who, on being asked mathematical questions by the female graduate student giving him a ride, bent over double in laughter saying, "A woman, talking mathematics, and foliations, it's too much."

The last two examples are extremes of course, and I have no idea how frequent that kind of behavior is. But what the various articles do make clear is that a woman who chooses to enter our profession can expect to face far greater barriers than a man, both from within the profession and from without. As I watch my own elder daughter enter her first year at college and observe the middle-school career of her younger sister, both of them talented at mathematics, I wonder if they too will face the obstacles described by the writers in the *Notices*. Certainly they will encounter mathematics and computer science departments where the faculty is almost all-male and the department secretary is female. So much for role models.

One acid test is whether male readers of FOCUS have reached this far in this editorial, or whether they gave up with a yawn half-way through the first paragraph. For those that have stayed with me, and I hope it is all of you, here are some addresses you might find useful.

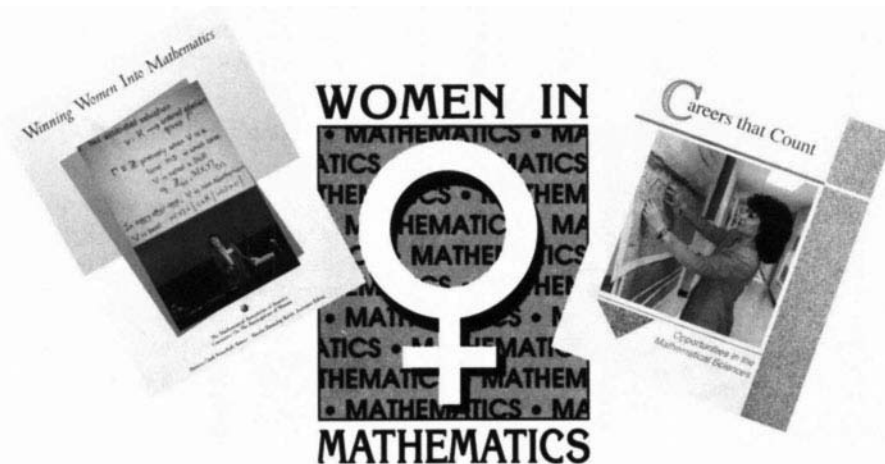
The brochure *Careers That Count*, published by the AWM in 1991, costs \$1.50 a copy (\$1.00 per copy for orders of ten or more) from the AWM, Box 178, Wellesley College, Wellesley, Massachusetts 02181. Information on membership in the AWM can also be obtained from that address.

Winning Women into Mathematics may be obtained for \$11.00 list price and \$9.00 members' price. Contact: Kathy H. Knust, Publications Assistant, The Mathematical Association of America, 1529 Eighteenth Street Northwest, Washington, DC 20036-1385.

There is also the Women and Mathematics (WAM) program, established in 1975 with a donation from IBM and sponsorship by the MAA. WAM aims at interesting young women in studying mathematics by providing role models, mentors, and academic career guidance. For information about this program, contact Alice J. Kelly, National Director, Women and Mathematics (WAM), Department of Mathematics, Santa Clara University, Santa Clara, California 95053.

Of course, for all the sudden appearance of a number of related publications, the problem of overcoming gender barriers in mathematics is not news. But it is reality. ■

The above opinions are those of the FOCUS editor. They do not necessarily represent the official view of the MAA.



Courses on Women and Mathematics

Have you taught such a course or seminar?

Are you in touch with anyone who has taught a course on this or a related topic (e.g. history of women and mathematics, women in science)?

Miriam P. Cooney is gathering course descriptions and would like to hear from anyone who has teaching experiences to share. The collected information could help others in planning such a course.

For additional information, write to: Miriam P. Cooney, Department of Mathematics, Saint Mary's College, Notre Dame, Indiana 46556. ■

Interview with the Don

In August 1991, Donald J. Albers moved from his home in California to the MAA headquarters in Washington, DC to take control of the MAA's publications and programs. No stranger to MAA members, Don is perhaps best known in the mathematical community at large as the coeditor, with MAA Secretary Gerald L. Alexanderson, of the popular *Mathematical People* (Birkhäuser, 1985), and with Alexanderson and Constance Reid, of the successor volume, *More Mathematical People* (Academic Press, 1990). Taking advantage of the arrival of a new Don at the Dolciani Mathematical Center, FOCUS turned the tables on Albers and put him in the interview seat. This is what we obtained.

FOCUS Well, Don, as a coauthor of the excellent *Mathematical People* books, how does it feel to be the target of an interview and not the interviewer?

ALBERS Strange and out-of-place since all of the subjects in *Mathematical People* are very prominent.

FOCUS It seems to me that you are pretty prominent yourself, though maybe in a different way than your subjects. But let's press on anyway. What exactly is your title at the MAA?

ALBERS Associate Director for Publications and Programs.

FOCUS What does the position involve?

ALBERS Supervision of all publications—books, journals, and newsletter—and providing Washington staff liaison for programs such as MAA Student Chapters, the Placement Testing Program, etc.

FOCUS Background. Where were you born and raised?

ALBERS I was born (the first of five children) and raised in North Dakota. I spent my first six years on a farm and attended a one-room school briefly before our family moved to Wahpeton, the sixth largest city in the state.

FOCUS You were an undergraduate at the University of North Dakota and did graduate work at Andrews University, the University of Minnesota, and the University of California at Santa Barbara. Correct?

ALBERS Yes.

FOCUS What areas of mathematics interested you most at that time?

ALBERS My interests as an undergraduate were polar: logic and foundations on one pole and physics on the other. As a graduate student, my interests shifted from point set topology to complex analysis to constructive linear algebra. Throughout my student days, problems of astrophysics were always lurking in the background.



FOCUS Let's pick up on your career again. In 1968 you went to Menlo College in Menlo Park, California, as Chair of the Mathematics Department. From 1981 to 1988 you were an Associate Dean there, and from 1988 to 1990 you were Special Assistant to the President. Right?

ALBERS Right.

FOCUS Did that last position take you away from mathematics very much?

ALBERS In 1990–1991, I served as Dean of Students, which certainly took me away from mathematics. Every faculty member should spend one and only one year as Dean of Students in order to gain a fuller appreciation of the other 90 percent of a student's life on campus.

FOCUS What motivated you to make the move to the MAA headquarters in Washington, DC?

ALBERS I have been associated with the MAA for fifteen years, in editorial roles and other committee roles. The Association is loaded with people who give selflessly of their own time and who are involved in doing genuinely good things for MAA members—students, faculty, and those outside academe. I also believe that the Washington staff, many of whom I have known for several years, is devoted to supporting the members. At the risk of sounding schmaltzy, coming to Washington gives me opportunities to play a more direct role in helping to develop good ideas.

FOCUS Now that we're onto the MAA, why don't you give us a brief history of your involvement in MAA activities.

ALBERS My involvement began about fifteen years ago with the Committee on Two-Year Colleges. During my tenure as chair, we introduced the then revolutionary ideas of minicourses and parallel sessions. After that I became Editor of the *College Mathematics Journal* (then the *Two-Year College Mathematics Journal*). In 1986 I was named Chair of both the Committee on Publications and the Publications Management Committee. In those positions I started SPECTRUM, our newest book series, and recruited several nice books. I greatly enjoy finding authors for MAA books. In some ways, my current position is a natural extension of what I've been doing for years.

In addition, I have been a member of committees, Second Vice President, and Governor of the Northern California Section.

FOCUS As far as I can tell, you have been involved in the writing of eight books. Is that correct?

ALBERS Yes.

FOCUS Tell us about the *Mathematical People* books. How do you go about setting up the interviews?

ALBERS As Editor of the *College Mathematics Journal*, I introduced the idea of interviewing prominent people associated with mathematics. The interviews were so popular that in short order the first collection of interviews was published as *Mathematical People*.

We generally begin by doing a lot of homework on the subjects and then contacting them by telephone. We explain that the interview process is generally painless and that nothing is printed without their permission. Since we had little money to do the volumes, we had to rely on national meetings or other good fortune to get together with subjects. We certainly would have liked to include more mathematicians from abroad, especially third world countries, but finances made that impossible.

FOCUS What is it about mathematicians that fascinates you so much—other than that they are your colleagues, I mean, since you have taken this interest to the stage of going out and interviewing them?

ALBERS I have been interested in mathematics and science since I was very young. Like many kids I dreamed of making great discoveries. Biographies such as Paul de Kruits' *The Microbe Hunters* and Harsanyi's *The Star Gazer* inspired me in junior high school. I did not come across Bell's *Men of Mathematics* until later in high school. In reviewing those books, it's clear that the attraction for me had much more to do with the human element than with the science found in them. In any community of mathematicians it's also clear that they are very interested in nonmathematical aspects of famous mathematicians. Combining my interest in biography with the apparent interest of others in seeing mathematicians as people led me to try out the interview idea in the pages of the *College Mathematics Journal*.

Why mathematicians? Obviously if one hopes to get beyond the surface at all, it helps to know something about the field. My "fascination" extends to other fields, such as physics, astronomy, and economics; and I have interviewed people from those fields as well. It is mathematics, however, that I like best. I shall always be

fascinated by people who have demonstrated mathematical facts which are "fascinating" to me. I still remember my first reactions to Cauchy's theorem and Cantor's proof that there is more than one infinity. At first I didn't believe their statements. Eventually I did. But how I would have liked to interview those guys!

FOCUS What are your current plans for MAA publications? How do you see this arm of the MAA developing over the coming years?

ALBERS We will continue to increase our production of books. It seems clear that our members like new books. We will do our best to accommodate them. In particular we will work hard to make more classroom materials available to faculty, i.e., to provide examples that are the flesh connecting the skeletons of various curriculum recommendations.

We will do much more to serve students by producing more career materials and by bringing out *Math Horizons*, a magazine for students. (The only item slowing up *Math Horizons* is money.)

We also are carrying out a review of the venerable CARUS series with an eye to doing modern versions of some of the older CARUS monographs.

The video game is just getting started. We are in the process of converting old MAA films into video formats—THE MAA CLASSICS SERIES.

There are lots of great projects to work on. I'm having a ball.



1991 MAA Journal Awards

Each year the MAA's three journal awards committees honor the most accomplished articles from each of the Association's periodicals—the Carl B. Allendoerfer Award for papers in *Mathematics Magazine*; the Lester R. Ford Award for papers in *The American Mathematical Monthly*; and the George Pólya Award for papers in *The College Mathematics Journal*. Winners receive a check, a certificate, and, most importantly, the respect and admiration of their colleagues. The mathematical community recognizes these authors for their exceptionally skillful mathematical exposition and for generously sharing their insights with us.

CARL B. ALLENDOERFER AWARD Ranjan Roy, Chair of the Department of Mathematics at Beloit College received this award for "The Discovery of the Series Formula of π by Leibniz, Gregory and Nilakantha," in *Mathematics Magazine*, 63 (1990): 291–306. Roy's paper "is well-written, is accompanied by an abundance of historical material, and should be comprehensible to any reader who has had a first course in calculus." Indeed, Roy's discussion of the development of the familiar series for $\pi/4$ and some related series may encourage readers "to ponder on the universality of mathematics and to arrive at a philosophy of mathematics and of its history within which this universality may be accommodated." Another Allendoerfer Award recipient, Philip Straffin, suggested the subject to his colleague Roy.

LESTER R. FORD AWARD Marcel Y. Berger, Director of the Institut des Hautes Études Scientifiques in Bures-sur-Yvette, France, accepted this award for his "Convexity" in the special geometry issue of *The American Mathematical Monthly*, 97 (1990): 650–678. At the suggestion of *Monthly* editor Herbert S. Wilf, Berger developed his article from a lecture first delivered in 1989 at the University of Pennsylvania. The product "surveys results about convex figures in Euclidean space," and discusses "extremal problems, volume estimation, computer storage of polyhedra, and algebraic operations on convex sets." The Ford Committee admired Berger's "informal and engaging" style and observes that "the author presents just enough detail to convey the essence without too many technicalities. Thus the reader is treated to a glimpse of a large amount of mathematics, but with sufficient detail to convey some important ideas."

The Ford Committee also recognized Ronald L. Graham and Frances Yao for "A Whirlwind Tour of Computational Geometry," in *The American Mathematical Monthly*, 97 (1990): 687–701. Yao, Principal Scientist and Manager of the Computer Science Library at Xerox's Palo Alto Research Center, explained her motivation to write: "In computational geometry, we search for efficient algorithms for solving geometric problems that arise in computer graphics, network design, etc. We have discovered that classical geometry often can play a key role in the design of novel geometric equations." Graham, Adjunct Director of Research for the Information Sciences Division of AT&T Bell Laboratories admitted that the award "pleasantly surprised" him. His and Yao's collaboration proved inspirational. "The authors are masters of the art of including enough detail to provide a good understanding of a problem, while suppressing detail when appropriate in order to portray the broad picture The beauty and depth of the subject are illustrated by a remarkable relation between convex hull algorithms in $d + 1$ dimensions and Voronoi diagrams in d dimensions, and by a problem about 'algebraic computation trees' that is solved with the help of the Betti numbers of a real algebraic variety. The writing is relaxed and lucid. This is one of those articles you don't put down till you get to the end."

The National Council of Teachers of Mathematics (NCTM) has received funding from the National Science Foundation (NSF) to provide partial financial support for up to forty US mathematics educators and mathematicians (preschool through collegiate levels) to participate in the Seventh International Congress on Mathematical Education (ICME-7), Québec City, Québec, Canada, 17–23 August 1992. For application materials, contact: ICME-7 Grant Program, Drawer E, National Council of Teachers of Mathematics, 1906 Association Drive, Reston, Virginia 22091. Deadline for receipt of completed application materials is **February 28, 1992**. ■

"In a set of n random intervals, what is the chance that one of the intervals intersects each of the others?" Joyce Justicz, Edward Scheinerman, and Peter Winkler pursued this "tantalizing, easily understood" question in "Random Intervals," in the *American Mathematical Monthly*, 97 (1990): 881–889. Justicz, a graduate student currently on leave from Emory University, Scheinerman, Associate Professor of Mathematical Sciences at Johns Hopkins University, and Winkler, Manager of Bellcore's Research Group in Mathematics and Theoretical Computer Science collaborated on this subject after deciding that, according to Justicz, "a combinatorial approach to theorem 4 would be more illustrative of the logic behind the final result. Scheinerman regarded the article as "a natural synthesis of . . . geometric representation of combinatorial structures and random graphs." The Ford Committee noted that the authors, however, did not conclude with that "tantalizing" question. "After solving their original problem by integrating a probability distribution, the authors treat us to a true gem. There is a rational number that answers their questions and is independent of n . This inspired them to find an elegant, combinatorial proof, avoiding any analytic computation, thereby demonstrating anew the interplay between various areas of mathematics."

GEORGE PÓLYA AWARD William B. Gearhart and Harris S. Shultz received this award for "The Function $\frac{\sin x}{x}$," in *The College Mathematics Journal*, 21 (1990): 90–99. Gearhart, Professor of Mathematics at California State University at Fullerton, traces his interest in the function $\frac{\sin x}{x}$ "as far back as my days in graduate school when I first noticed its use in electrical engineering." Schult, also a Professor of Mathematics at California State University at Fullerton succinctly located his motivation in an "interest in the center of mass of a slice of pie." Together, Gearhart's and Shultz's enthusiasm produced a brief survey of the "more advanced applications in Fourier theory, signal analysis, and approximation theory, providing a balanced picture of the fundamental role played by the sine function in mathematics and its applications." In addition, the Pólya Committee noted that the essay's "good list of references invites the reader to learn more about some of the remarkable results touched on in this stimulating survey article."

When the Pólya Committee honored Mark Ford Schilling, Professor of Mathematics at California State University of Northridge, Schilling declared "I feel honored to be in the company of such illustrious mathematical luminaries as the previous winners of the award." Schilling's exceptional paper, "The Longest Run of Heads," in *The College Mathematics Journal*, 21 (1990): 196–207, emerged from his fascination with Bernoulli trials—"simple in form yet often quite remarkable. They deserve exposure to a wide, mathematically literate audience." His desire to communicate this fascination succeeds splendidly. "The problem here grabs the reader's attention, and its ramifications are followed with a nice mix of intuition, computation, and theory. The author takes every opportunity to explain the ideas behind the required calculations, interpreting the results at every stage with well-chosen examples The author's enthusiasm is contagious, making the article an excellent source for an undergraduate research project."

Finally, the Merten M. Hasse Committee presents its journal awards to an author who is under forty years of age at the time of publication. In 1991, Barry A. Cipra, freelance mathematics reporter, accepted the Hasse Prize for "An Introduction to the Ising Model," in the *American Mathematical Monthly*, 94 (1987): 937–959. The Ising model "concerns the physics of phase transitions . . . [and] tried to explain how short-range interaction between molecules can give rise to long-range behavior." Cipra characterizes the model as a source of "an understanding of what happens when water boils, ice melts, or a magnet is heated to the point of losing its magnetism." His article's success at exploring the Ising model "manages to draw the reader gradually into the intricacies of a very difficult problem. The exposition proceeds without the reader's ever losing sight of the tactical purpose of each step, even though the successive stages of the investigation bring up a surprising number of fields of mathematics from which Cipra plucks just the few key ideas and the minimum of needed notation."

NEW BOOKS

From The Mathematical Association of America

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Marta Sved

This charming book introduces us to topics in hyperbolic geometry in a delightfully informal style. Early in the 19th century, Janos Bolyai created "non-Euclidean" geometry, discovered independently by two other mathematicians of Bolyai's day, Gauss, and Lobachevsky. At the time, these concepts were too revolutionary to make a serious impact. However, later developments in relativity theory and twentieth century perceptions made hyperbolic geometry an integral part of geometry, logically as perfect as classical geometry, yet strangely surprising.

The background required is minimal--standard high school geometry--yet the serious student, aided by problems attached to each chapter, should acquire a deeper understanding of the subject.

192 pp., Paperbound, 1991
ISBN 0-88385-500-3
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Part of the broad appeal of mathematics is that there are simply stated questions that have not yet been answered. These questions are plentiful in the areas of plane geometry and number theory, and the purpose of this book is to discuss some unsolved problems in these fields. Many of the questions can be understood by readers with a very modest mathematical background.

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POLYOMINOES:
A Guide to
Puzzles and Problems in Tiling

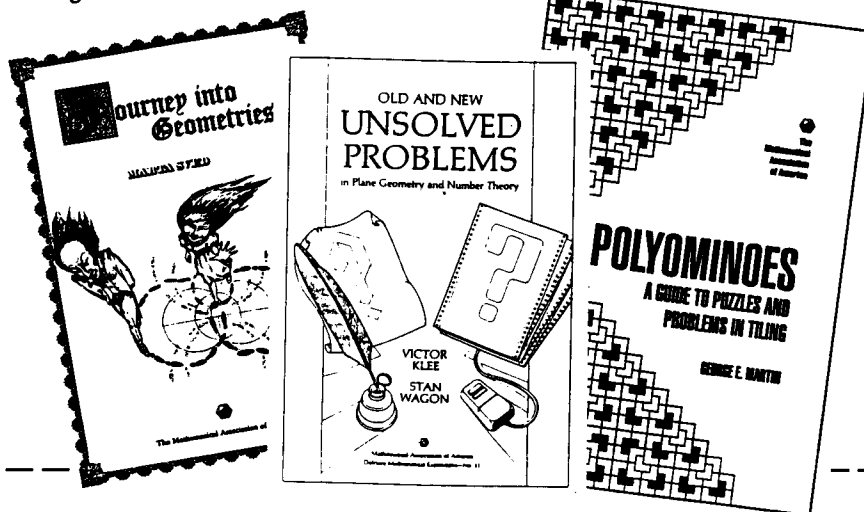
George Martin

George Martin has done a truly marvelous job of presenting the material in this book in an attractive and clear way.

POLYOMINOES will delight not only students and teachers of mathematics at all levels, but will be appreciated by anyone who likes a good geometric challenge. There are no prerequisites. If you like jigsaw puzzles or if you hate jigsaw puzzles but have ever wondered about the pattern of some floor tiling, there is much here to interest you.

A polyomino is a shape cut along the lines from square graph paper; the pronunciation of *polyomino* begins as does *polygon* and ends as does *domino*. Tiling with polyominoes provides challenges that range from the popular jigsaw-like puzzles to easily understood mathematical research problems. You will find unsolved puzzles and problems of both kinds here. Answers are provided for most of the problems that have a known solution. No formal mathematical training is required to enjoy this book.

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Monday, 16 December 1991
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Telephone: (202) 387-5200
FAX: (202) 265-2384
e-mail: maa@athena.umd.edu

ARKANSAS GOVERNOR'S SCHOOL

To apply for a faculty position in a state-funded, competitive, comprehensive, liberal arts, summer residential program (6-9/7-25 92) on the Hendrix College campus, for 400 gifted-talented rising high school seniors, contact:

Ms. Martha Bass
Arkansas Department of Education
4 Capitol Mall
Little Rock, AR 72201
(501) 682-4224 or (501) 450-1375

Deadline: **January 6, 1992.**

FORT LEWIS COLLEGE

Fort Lewis College anticipates an opening for a tenure-track position in mathematics beginning September 1992. The individual will be the coordinator of the precalculus level mathematics classes. The duties will include teaching college algebra and precalculus classes and may include an occasional freshman or sophomore composition seminar. The work load will be the equivalent of a 12 hour teaching load and normal college committee responsibilities. The Department of Mathematics is investigating innovative methods to improve student success in these entry level courses and has initiated a project in college algebra using a mathematics resources laboratory. The successful candidate will coordinate the development of this approach as well as advance other innovative methods to improve student success. Experience in the area and a PhD or EdD in mathematics or mathematics education are highly desirable; but an individual with master's degree and exceptional experience will be considered. Send letter of application, college transcripts, and three letters of reference (related to the duties of this position) to: Dr. Greg Bell, Chair, Mathematics Department, Fort Lewis College, Durango, CO 81301-3999 by **February 1, 1992**. FLC is an AA-EEO employer.

SALISBURY STATE UNIVERSITY

Dr. Donald Cathcart
Search Committee Chair
Department of Mathematics
and Computer Science
Salisbury, Maryland 21801

Applications are invited for an anticipated tenure-track position to begin August 15, 1992 at the assistant professor level. Preference will be given to candidates in discrete or geometrical modeling or dynamical systems. Commitment to the mathematical sciences point of view (a blending of pure and applied mathematics, statistics, and computer science), strong communication and teaching skills, a doctorate in a mathematical science by June 1992, and scholarly activity are essential. Candidates must be able to teach service and major courses, and those who can stimulate undergraduate mathematical activity will be given special consideration. Rank and salary will be commensurate with credentials and experience.

Salisbury State, a comprehensive university located on Maryland's Eastern Shore and enrolling over 5,800 students, is part of the University of Maryland systems. Classrooms have PCs equipped with a data display. Classrooms, faculty offices, and a student lab are served by a local area network and have direct access to the University's Vax cluster.

Send a letter of application, curriculum vitae, unofficial transcripts, and three letters or recommendation, at least one addressing teaching, to the Search Committee. Screening of applications will begin **January 15, 1992** and will continue until the position is filled. Non-US citizens must have US Immigration and Naturalization Authorization to accept employment in this country.

Salisbury State University is an Affirmative Action-Equal Opportunity Employer. Women, minorities, and disabled persons are encouraged to apply.

DARTMOUTH COLLEGE

The Department of Mathematics and Computer Science has an opening for a tenure-track assistant professor in mathematics, with initial appointment in the 1992-1993 academic year. A candidate for the position must be committed to outstanding teaching at all levels of the undergraduate and graduate curriculum and must give evidence of a well-regarded research program that shows real promise for the future. Candidates with several years of experience should, in addition, be ready to direct PhD theses.

To create an atmosphere supportive of research, Dartmouth offers new faculty members grants for research-related expenses, a quarter of sabbatical leave for each three academic years in residence, and flexible scheduling of teaching responsibilities. The teaching responsibility in mathematics is four courses spread over two or three quarters. The department encourages good teaching with a combination of committed colleagues and bright, responsive students.

Applications are welcome in all fields of mathematics and statistics; the department expects to be able to give applicants more information about departmental priorities after completion of a major departmental planning effort in early 1992. To apply for the position, send a letter of application, curriculum vitae, and a brief statement of research results and interests. Also arrange for four letters of reference to be sent, at least one of which addresses teaching, and, if the applicant's native language is not English, the applicant's ability to use English in a classroom. All application materials should be addressed to Phyllis Bellmore, Recruiting Secretary, Mathematics and Computer Science, 6188 Bradley Hall, Dartmouth College, Hanover, NH 03755-3551. Applications completed by **February 1** will receive first consideration. Dartmouth is committed to Affirmative Action and encourages applications from African Americans, Asian Americans, Hispanics, Native Americans, and women. Specific questions on the selection process can be directed to C. Dwight Lahr, Recruiting Chair.

DARTMOUTH COLLEGE

John Wesley Young
Research Instructorship in Mathematics

The John Wesley Young Research Instructorship is a two-year, postdoctoral appointment for promising new or recent PhDs whose research interests overlap a department member's. Current departmental interests include areas in algebra, analysis, algebraic geometry, combinatorics, computer science, differential geometry, logic and set theory, number theory, probability, and topology. Teaching duties of four ten-week courses spread over two or three quarters typically include at least one course in the instructor's specialty and include, elementary, advanced, and (at instructor's option) graduate courses. Nine-month salary of \$34,000 supplemented by summer (resident) research stipend of \$7,556. Send letter of application, resumé, graduate transcript, thesis abstract, description of other research activities and interests if appropriate, and 3 or preferably 4 letters of recommendation (at least one should discuss teaching) to Phyllis A. Bellmore, Mathematics and Computer Science, 6188 Bradley Hall, Hanover, NH 03755-3551. Applications received by **Jan. 15** receive first consideration; applications will be accepted until position is filled. Dartmouth College is committed to affirmative action and strongly encourages applications from minorities and women.

GMI ENGINEERING & MANAGEMENT INSTITUTE

Department of Science and Mathematics

GMI Engineering & Management Institute invites applications for one or more tenure-track positions in mathematics at the level of assistant professor or higher. At least one position will be filled by **September 15, 1992**.

GMI operates a five-year, fully-cooperative plan of education. The Science and Mathematics Department offers a bachelor of science degree in applied mathematics, as well as courses at all levels as an active participant in the engineering and management bachelor's and master's degree programs.

The successful candidates must demonstrate outstanding teaching and research capability. They must also show an interest in using the computer in both teaching and research. A PhD in mathematics or related area is required. We are especially interested in applicants with a background in applied mathematics, computer science, statistics, or actuarial science. Please send resumé, statement of research interests and at least three letters of recommendation to: **Dr. S. Chakravathy, Chair, Mathematics Search Committee, Department of Science and Mathematics, GMI Engineering & Management Institute, Flint, Michigan 48504-4898. Applications will be accepted until February 15, 1992.**

GMI is an Affirmative Action-Equal Opportunity Employer. Women and minority candidates are particularly encouraged to apply.

UNIVERSITY OF TEXAS of the PERMIAN BASIN

One or more tenure-track position(s) in the Department of Mathematics and Computer Science at the rank of assistant-associate professor, starting September 1, 1992. Candidates should have the PhD in mathematics or computer science and be able to contribute to both the teaching and research missions of the department. Primary teaching responsibility will be in mathematics, but preference will be given to candidates who can share in the teaching of computer science. After almost twenty years as an upper division and graduate institution, UT Permian Basin admitted its first freshman class in the fall of 1991. The State of Texas requires all faculty in higher education to be proficient in both written and spoken English. Candidates whose first language is not English will be expected to provide evidence of such proficiency. EEO/AA.

Interested candidates should send a resumé and three letters of reference by **February 1, 1992** to:

Dr. J. A. Nickel
Division of Science and Engineering
The University of Texas of the Permian Basin
Box 8385
Odessa, Texas 79762-0001

BELLARMINE COLLEGE

Tenure-track position in analysis beginning fall 1992. PhD required. Should possess a dedication to quality teaching at a liberal arts college. Consideration will begin **Feb. 1, 1992**. Send letter of application, transcript, and letter of recommendation along with vita to: **Dr. Muzaffar Ali, Department of Mathematics, Bellarmine College, 2001 Newburg Road, Louisville, KY 40205-0671.**

ITHACA COLLEGE

The Department of Mathematics and Computer Science at Ithaca College invites applications for one tenure-eligible position in mathematics beginning August 1992. Qualifications: PhD in mathematics, applied mathematics, or statistics in hand at time of application preferred; applicants with PhD expected by August 1992 will also be considered. The successful candidate will be expected to demonstrate a strong commitment to undergraduate mathematics education. Screening begins **December 16, 1991**. Send vita to: **Dr. Diane D. Schwartz, Department of Mathematics and Computer Science, Ithaca College, Ithaca, New York 14850. An Affirmative Action-Equal Opportunity Employer.**

BUFFALO STATE COLLEGE

Department of Mathematics

Applications are invited for tenure-track assistant professor positions beginning 9/1/92 (pending budget approval).

MATHEMATICS. PhD in mathematical sciences, experience using technology. Must have teaching ability, interest in students, and wide range of undergrad math courses, and teaching graduate math to secondary math teachers. Should expect to use technology in instruction. Experience in new curriculum or pedagogical techniques preferred.

MATHEMATICS EDUCATION. PhD/EdD in math ed with MA/MS in mathematical sciences (30 grad hrs). Must have teaching ability, interest in undergrad and grad math ed students, student teachers, and using technology to teach math. Experience with elementary math programs desirable.

Faculty members are expected to grow professionally, contribute to existing programs, advise students, and participate in departmental or college committees. Course load 9 hours. Salary competitive. Applications reviewed beginning **November 15, 1991** and accepted until positions filled. Send cover letter, vita, transcripts, and 3 letters of reference to:

Betty Krist, Chair, Mathematics
Buffalo State College
1300 Elmwood Avenue
Buffalo, NY 14222
(716) 878-5621

Committed to affirmative action-equal opportunity, we urge women and minority candidates to apply.

MATHEMATICS

Assistant-associate, tenure-track position beginning fall 1992. Teach introductory and advanced undergraduate courses in mathematics (12 credits per semester), serve on committees, review and plan curriculum, advise students. Qualifications: Doctorate in mathematics or related field, full-time college teaching experience; record of scholarly activity; excellent oral communication skills and strong commitment to teaching required; people with experience in mathematics education encouraged to apply. Rank and salary dependent upon qualifications; minimum for assistant, \$28,200; associate, \$33,450. Send letter of application, resumé, and three letters of recommendation documenting teaching excellence to Gaynelle Pratt, Office of Human Resource Management, Keene State College, Keene, NH 03431. Non-US citizens include current visa status. Review of applications begins **January 20, 1992**. Keene State College will be represented at the January 1992 AMS/MAA meeting in Baltimore.

NORTHERN ARIZONA UNIVERSITY

Flagstaff, Arizona

The Department of Mathematics announces tenure-track openings for fall 1992.

Ordinary Differential Equations. Assistant professor with specialty in the geometric theory of dynamical systems supporting work of our existing special research focus, especially planar systems with polynomial right-hand sides of bifurcation theory.

Mathematics Education. Professor with commensurate record of research, leadership at the university and national level, and experience with teacher education programs.

Statistics. Assistant professor with strong theoretical background and interest in intramural consulting; with preference given to those with actuarial expertise.

Each requires a doctorate, demonstrated potential for a productive, quality research program, and substantial evidence of high-quality teaching.

Flagstaff is located in the cool pine forests of northern Arizona, near high mountains and numerous natural attractions. NAU has an on campus enrollment of approximately 14,000. The Department of 31 faculty offers bachelor's and master's degree programs.

Send vita and direct three letters of reference to: Screening Committee, Department of Mathematics, PO Box 5717, NAU, Flagstaff, AZ 86011. The searches will remain open until the positions are filled; however, the Screening Committee will begin reviewing applications on **January 3, 1991**. Northern Arizona University is an Equal Opportunity/Affirmative Action Institution. Women and minorities are encouraged to apply.

FAIRMONT STATE COLLEGE

Applications are solicited for a position of instructor or assistant professor of mathematics beginning in the fall of 1991. This is a tenure-track position with responsibilities of teaching undergraduate mathematics courses ranging from introductory algebra to calculus to advanced elective courses, advising math majors, and participating in college activities. An applicant with PhD in mathematics or nearing completion of doctorate preferred. Master's degree plus willingness to pursue doctorate is minimum. Fairmont State College is the largest of West Virginia's state-supported college with more than 6,000 students and offers a wide range of both baccalaureate and associate degrees. Fairmont is about 90 miles south of Pittsburgh on Interstate 79. Send letter of application, resumé, graduate and undergraduate transcripts, and three letters of reference before **December 31, 1991** to: **Dr. Elizabeth D. Swiger, Chair, Division of Science, Mathematics, and Health Careers, Fairmont State College, Fairmont, WV 26554. Fairmont State College is an Equal Opportunity Affirmative Action Institution.**

CALIFORNIA STATE UNIVERSITY FULLERTON

The Department of Mathematics at California State University, Fullerton is offering a tenure-track position at the assistant or associate professor level starting in fall 1992. Rank and salary will be determined by the qualifications of the successful applicant. Candidates must possess a PhD in mathematics, strong teaching references, and show evidence of a commitment to continuing research in the following areas listed in order of preference: numerical analysis, discrete mathematics, or partial differential equations.

A letter of application, curriculum vitae, and three letters of reference should be sent to: Chair of the Selection Committee, Department of Mathematics, California State University, Fullerton, Fullerton, CA 92634. To guarantee consideration for this position, all application documents should be received by **February 21, 1992**. California State University, Fullerton is an Affirmative Action/Equal Opportunity/Title IX Employer.

CALIFORNIA STATE UNIVERSITY FULLERTON

The Department of Mathematics at California State University, Fullerton is offering a tenure-track position at the assistant or associate professor level starting in fall 1992. Rank and salary will be determined by the qualifications of the successful applicant. Candidates must possess a master's degree in mathematics and a doctorate in mathematics or mathematics education. Candidates should also have experience teaching at the precollege level and some preference will be given for interest and expertise at the K-8 level. Additional requirements include strong teaching references and evidence of a commitment to continuing research in mathematics education.

A letter of application, curriculum vitae, and three letters of reference should be sent to: Chair of the Selection Committee, Department of Mathematics, California State University, Fullerton, Fullerton, CA 92634. To guarantee consideration for this position, all application documents should be received by **February 21, 1992**. California State University, Fullerton is an Affirmative Action/Equal Opportunity/Title IX Employer.

THE UNIVERSITY OF SCRANTON Mathematics Department

The University of Scranton, a Jesuit university with over 3,500 undergraduates, anticipates an opening in the academic year 1992-93 for an entry-level assistant professor of mathematics, tenure-track. Applications are invited from qualified candidates interested in a teaching environment where research is encouraged and supported. Applicants are required to have a PhD in mathematics or near completion. Individuals with expertise in any area of mathematics will be considered; however, preferred areas include probability-statistics, actuarial mathematics, applied mathematics, algebra, and analysis.

Submit a vita, copies of transcripts, and three letters of recommendation attesting to teaching and research ability to: Mathematics Faculty Search Committee, University of Scranton, Scranton, PA 18510-4666 or phone (717) 941-6113. Interviews will be conducted at the Baltimore meeting Employment Register in January. The University of Scranton is an Affirmative Action-Equal Opportunity Employer.

MATHEMATICS DEPARTMENT UNIVERSITY OF NORTH DAKOTA

PO Box 8162 University Station
Grand Forks, ND 58202

Applications are invited for 2 or more tenure-track positions at the assistant professor level starting August 16, 1992. Consideration will be given to all areas of mathematics, as well as statistics and math education. Applicant must possess a strong commitment to teaching and research and have completed PhD requirements by starting date. Teaching loads are three courses/semester. Must be eligible to work in US. Salary and fringes competitive. Send current resumé, copy of transcripts, and three letters of reference to: Selection Committee. Review of applications begins **February 3, 1992** and continues until positions are filled. UND is an AA/EOE.

YESHIVA UNIVERSITY

Department of Mathematics

The small, selective liberal arts colleges of Yeshiva University invite applications for a tenure-track position starting in fall 1992 at the rank of assistant-associate professor. Responsibilities include teaching 12 hrs/sem and active scholarship at a level consistent with the teaching load. Rank and salary commensurate with background and experience. Qualifications: PhD, postdoctoral teaching experience with a record of excellence, and a commitment to undergraduate teaching and productive scholarship. Send letter, vita, and have three letters of reference sent to: Dean Norman S. Rosenfeld, Yeshiva College, New York, NY 10033. (EOE.)

ST. MARY'S UNIVERSITY

San Antonio, Texas

The Department of Mathematics invites applications for a tenure-track position at the assistant or associate professor level beginning in the fall semester of 1992. Requirements include a doctorate in mathematics or mathematics education, and a strong commitment to both teaching at the undergraduate level and to continued scholarly activity. In addition the candidate should have an interest and, preferably, experience in interaction with local school districts and in using technology in the teaching of mathematics.

Send a letter of application including a statement of professional goals, resumé, and three letters of reference to:

Dr. S. Eugene Sims, Chair
Department of Mathematics
St. Mary's University
San Antonio, TX 78228-8560

The closing date for applications is **February 24, 1992**. St. Mary's University is an Equal Opportunity Employer.

LETOURNEAU UNIVERSITY

Computer science-mathematics—PhD in computer science preferred; master's and experience acceptable. Responsibilities include teaching mostly computer and some math courses, advising students, and serving on committees. LeTourneau University is an independent evangelical Christian university and seeks trained professionals who possess a maturing Christian faith and are committed to the mission of the university. Send resumé to: Dr. H. Glenn Sumrall, Vice-President for Academic Affairs, LeTourneau University, PO Box 7001, Longview, TX 75607-7001.

INSTRUCTOR OR ASSISTANT PROFESSOR OF MATHEMATICS

(a) Teach intro courses in math including algebra, statistics, calculus, math for elementary ed, and developmental math; (b) Participate in departmental activities & serve on committees; (c) Research and professional growth encouraged. *Qualifications:* Doctorate in math or math education preferred; master's in math or math education required; some teaching experience desired. *Contract Terms:* Full-time academic year position on probationary track (master's and rank of instructor) contract with possibility for renewal for up to 5 years or conversion to continuing lecturer. *Salary Range:* \$22-30,000, depending on education and experience. *Applications Procedures:* Interested individuals must send a letter of application and resumé or vita and initiate appropriate action to ensure that *official transcripts* and at least 3 recent (dated within past year) letters of reference are sent directly to: Office of Dean, Firelands College-BGSU, 901 Rye Beach Rd. Huron, OH 44839 by 3-1-92. Firelands College is an equal opportunity employer and encourages minorities and women to apply.

ARIZONA STATE UNIVERSITY WEST

Interdisciplinary Arts and Sciences Program

Associate Professor of Mathematics

ASU West seeks an associate professor of mathematics with substantial scholarly record and teaching experience to help build an innovative, interdisciplinary arts and sciences degree program. Teaching responsibilities will include traditional, upper-division mathematics courses and interdisciplinary, team-taught seminars. Demonstrated commitment to program development and to mentoring students desired. The PhD in mathematics or related specialization area and a commitment to interdisciplinary teaching/scholarly programs required.

Submit a letter of application describing specific qualifications for position, cv, and names and addresses of three references to:

Thomas V. McGovern, Coordinator
Interdisciplinary Arts and Sciences Program
Arizona State University West
4701 W. Thunderbird Road
Phoenix, AZ 85069-7100

Application deadline is **January 15, 1992** or the 15th of each month thereafter until filled. ASU West is an AA/EO Employer.

BARUCH COLLEGE-CUNY

Department of Mathematics

Tenure-track position at asst-assoc rank beginning 8/31/92. A PhD in mathematics is required. Quality teaching, student support, and curricular development are primary concerns while scholarly publications are expected for all future promotion and tenure decisions. A proven record of excellence in teaching, curriculum development, and scholarly publication is preferable and past successful grant funding is very desirable. Applications must be received by **2/3/92**. Salary ranges from \$28,630 to \$55,179. Send resumé and three letters of recommendation to: Baruch College, Dept. of Mathematics-Search Committee, Box 509, 17 Lexington Avenue, New York, NY 10010. Baruch is an EOE/AA employer; women and minorities are encouraged to apply.

THE UNIVERSITY OF IOWA
Mathematics Education

The University of Iowa's Division of Curriculum and instruction is seeking applicants for a tenure-track faculty position in mathematics education. The responsibilities of the position include teaching two courses per semester from among the elementary or secondary mathematics teacher preparation courses and the MA and PhD mathematics education courses. Conducting and reporting research in mathematics education is also an expectation. Candidates should hold a PhD in mathematics education or equivalent program; have successful teaching experience at either the elementary or secondary school level, have strong preparation in mathematics, demonstrate a commitment to research and publication in mathematics education, and have a commitment to excellence in teaching. Applications will be reviewed beginning **January 15, 1992**, and continue until the position is filled. Send letter of application, vita, transcripts, and three letters of recommendation to: Mathematics Education Search Committee, c/o Dr. Harold L. Schoen, Division of Curriculum and Instruction, N259 Lindquist Center, University of Iowa, Iowa City, IA 52242. The University of Iowa is an equal opportunity, affirmative action employer. We are especially interested in receiving applications from women and minorities.

HILLSDALE COLLEGE
Department of Mathematics
Hillsdale, MI 49242

An independent, coeducational, liberal arts college of 1,200 students seeks a mathematician for a tenure-track position as assistant professor of mathematics to begin August 1992. A candidate should hold the PhD in mathematics and should expect to teach all levels of undergraduate mathematics. In addition to a 12-hour teaching load per semester, duties will include academic advising and college service. A commitment to quality liberal arts education and experience in undergraduate teaching of mathematics will be important. Salary will be competitive and commensurate with qualifications. Send letter of application, resumé, a statement of your teaching philosophy, and three letters of reference to: Prof. Mark J. Watson, Chair, at the above address by **January 31, 1992**. EOE.

HILLSDALE COLLEGE
Department of Mathematics
Hillsdale, MI 49242

An independent, coeducational, liberal arts college of 1,200 students seeks two computer scientist/mathematicians for tenure-track positions. Both positions will be joint appointments as assistant professor of mathematics and computer science to begin August 1992. For each position, preference will be given to candidates holding a PhD in computer science or a PhD in mathematics or a related area with a strong or developing expertise in computer science. In addition to a 12-hour teaching load per semester, duties will include academic advising and college service. A commitment to quality liberal arts education and experience in undergraduate teaching will be important. Salary will be competitive and commensurate with qualifications. Send letter of application, resumé, a statement about your teaching philosophy, and three letters of reference to: Prof. Mark J. Watson, Chair, at the above address by **January 31, 1992**. EOE.

MATHEMATICS

Georgia College, a senior unit of the University System of Georgia with a current enrollment of 5,000 students, is accepting applications for a tenure-track position in mathematics starting September 1, 1992. PhD in mathematics required. Teaching experience highly desirable. This position offers an opportunity to teach a variety of undergraduate courses. Rank and salary commensurate with qualifications. Submit a letter of application, resumé, copies of transcripts, and the names, addresses, and phone numbers of three references to: Dr. Donald A. King, Department of Mathematics and Computer Science, CBX 017, Georgia College, Milledgeville, GA 31061. Deadline **January 1, 1992** or until position is filled. Georgia College is an Affirmative Action, Equal Opportunity Employer.

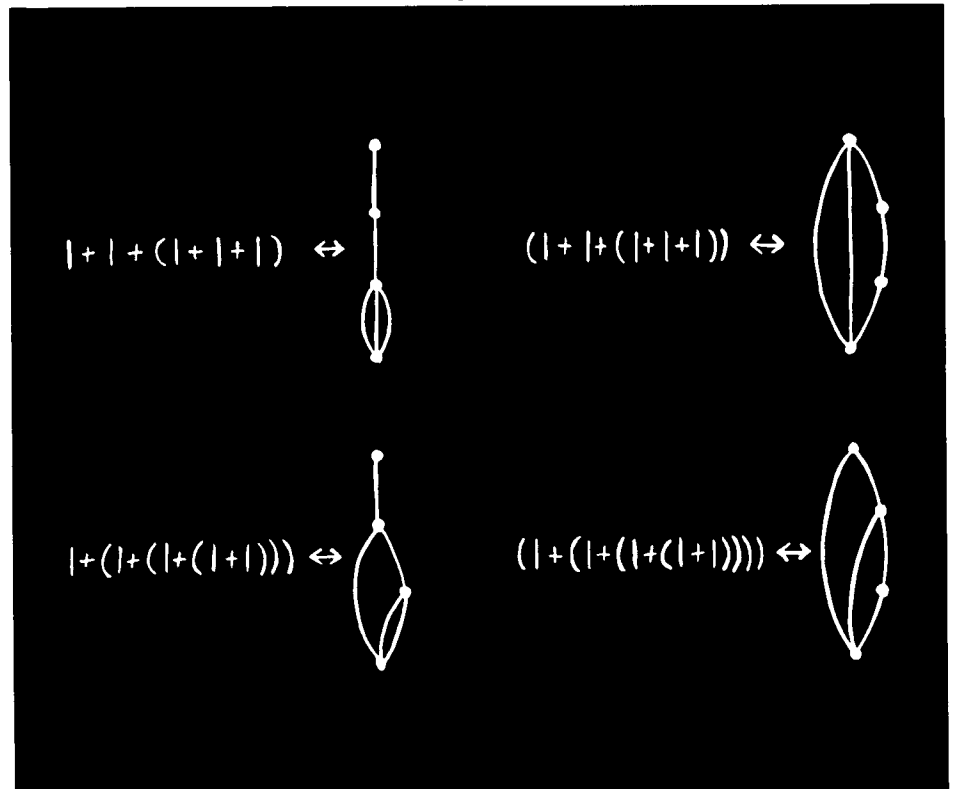
WILLIAMS COLLEGE
Department of Mathematics
Williamstown, MA 01267

Anticipated part-time position, for fall 1992 and/or spring 1993, teaching one or two courses in quantitative studies or possibly other topics, probably at the rank of lecturer.

Proven success in teaching a general college course such as algebra, trigonometry, or precalculus is essential. Other possible qualifications might include a background in statistics, a PhD, a commitment to scholarship.

Please send a vita and three letters of recommendation to Frank Morgan, Chair. Evaluation of applications may begin as early as **November 15, 1991**, and continue until the position is filled. AA/EOE.

Intrigued?



Then consider joining a highly talented group of mathematicians whose job it is to deduce structure where structure is not apparent, to find patterns in seemingly random sets, to create order out of chaos.

These are the mathematicians of the National Security Agency. They contribute to the solution of cryptologic problems using Number Theory, Group Theory, Finite Field Theory, Linear Algebra, Probability Theory, Mathematical

Statistics, Combinatorics and more. And they function as a true community, exchanging ideas and working with some of the finest minds—and most powerful computers—in the country.

If you love problem-solving and like the idea that those solutions will be applied to real world problems, look into a career with NSA. Send your resume to the address below or contact your campus placement office.



Attn: M322 (AEM), Ft. Meade, Maryland 20755-6000
 An equal opportunity employer. U.S. citizenship required for applicant and immediate family members.

TOWSON STATE UNIVERSITY

Department of Mathematics
Baltimore, Maryland 21204

Tenure-track assistant or associate professor in mathematics education available fall 92, contingent on state funding. Teach 12 hours/semester of undergraduate courses. A doctorate in mathematics education and a commitment to teaching and research are required. Preference will be given to applicants with 3 years' teaching-research experience in elementary and/or early childhood education. Minorities are encouraged to apply. Salary and rank are commensurate with experience and background. Send resumé, 3 letters of recommendation, and all undergraduate and graduate transcripts by **February 14, 1992** to Robert Hanson, Chairperson, Search Committee. AA/EOE.

MANSFIELD UNIVERSITY

Mansfield University is seeking applicants for a tenure-track position in the education department. Responsibilities include teaching elementary and secondary school mathematics methods on the graduate and undergraduate level; contemporary education issues, and student teaching supervision; opportunity exists to expand departmental offerings in elementary diagnostic-prescriptive mathematics education. Qualifications include full-time public elementary or middle school teaching experience; college teaching and computer background are desirable; demonstrated background in mathematics education essential. Master's degree required, a doctorate necessary for tenure. Salary based on experience and qualifications. Start date will be the 1992 fall semester. Applications must submit a letter of intent, graduate and undergraduate transcripts, resumé, and three current (1990-91) letters of reference to *Position F-117*, Human Resources Department, G-1 Alumni Hall, Mansfield University, Mansfield, PA 16933. All materials must be postmarked by **February 15, 1992**. Mansfield University is an Affirmative Action Employer and encourages the applications of women, minorities, and the handicapped.

**THE UNIVERSITY OF WYOMING
DEPARTMENT OF MATHEMATICS****Position in Mathematics**

Applications are invited for two faculty positions at the rank of instructor. The positions require at least a master's in mathematics with a minimum of 4 years experience teaching at the university level. Excellence in teaching (with a capability of teaching all levels of calculus and linear algebra) and strong interests in professional development will be expected of the successful applicant.

One position requires computer experience sufficient to provide support for faculty and the department's instructional computer lab. This position entails full-time teaching (2 courses per semester) and half-time computer supervision-support.

The second position is for full-time teaching (12 hours per semester.)

Send resume and direct three letters of recommendation to:

John George, Head
Department of Mathematics
University of Wyoming
PO Box 3036
Laramie, Wyoming 82071-3036

The University of Wyoming is an AA/EOE employer.

CARTHAGE COLLEGE

Kenosha, Wisconsin

Applications are invited for two tenure-track assistant professor positions, to begin fall 1992. A strong general mathematical background, including a PhD is expected. One of the positions requires an interest in probability and/or statistics. Commitment to excellence in undergraduate instruction, continued mathematical scholarship, and development of independent student mathematical work is required. Carthage College is a liberal arts college located on Lake Michigan between Chicago and Milwaukee, with a growing enrollment and an expanding mathematics department. The college seeks candidates who wish to participate in the building of a strong mathematics program and who would also look forward to developing interdisciplinary ties in a college-wide setting.

Applications, consisting of transcripts and three letters of reference, should be submitted to: Dr. Thomas A. Brawner, Chairperson of the Division of Natural Sciences, Carthage College, Kenosha, WI 53140. Review of applications will begin on **December 1, 1991**. A representative from the department will attend the joint AMS-MAA January 1992 meetings in Baltimore and meet with interested candidates. Strong candidates not able to attend the meetings will also be considered.

Carthage College is an equal opportunity employer and specifically invites and encourages applications from women and minorities.

MUHLENBERG COLLEGE**Truman Koehler Professorship of Mathematics**

The department seeks nominations or applications for this tenure-track professorship beginning August 1992. Requirements include a doctorate in the mathematical sciences, a minimum of five years college-level teaching, a publication record, and demonstrable competence in undergraduate teaching and student research-independent study.

Muhlenberg College is an independent, undergraduate, coeducational institution. Located in Allentown, Pennsylvania, just south of the Pocono mountains, the college is 55 miles north of Philadelphia and 90 miles west of New York City.

Please address all correspondence to Dr. John Meyer, Head, Dept. of Mathematics, Muhlenberg College, Allentown, PA 18104. Applications should include a letter of interest, resumé, and names of three references. Screening will begin in early January, with the possibility of preliminary interviews at the Baltimore meetings. EOE.

**SOUTHEASTERN
LOUISIANA UNIVERSITY**

Department of Mathematics

The department expects to make one or more tenure-track appointments, at the assistant professor level, to begin in the fall of 1992. Strong research potential and a commitment to excellence in teaching are required. Applicants in all areas of mathematics will be considered; however, preference will be given to applied mathematics and algebra. Applications will be accepted until positions are filled. Send vita and three letters of recommendation to: Professor Steve Ligh, Head, Department of Mathematics, Box 687 SLU, Hammond, LA 70402; Ligh@slu.bitnet. SLU is an Affirmative Action-Equal Opportunity Employer. Women and minorities are encouraged to apply.

**DIRECTOR OF
DEVELOPMENTAL MATHEMATICS**

SUNY College at Brockport

Coordinate General Education Mathematics Program. Supervise teachers and Math Clinic, teach developmental mathematics courses. Tenure-track position as assistant professor in mathematics department, starting September 1, 1992. Doctorate in mathematics or mathematics education, four years' college teaching experience, and a record of scholarly productivity in mathematics or mathematics education required. Strong commitment to teaching a culturally diverse student body. For further information, call: (716) 395-2194. Send resumé, transcripts, three letters of reference to: Office of Faculty/Staff Relations, SUNY College at Brockport, Brockport, NY 14420. Apply by **December 16** for early consideration; applications will continue to be accepted until position is filled. AA/EOE.

STATE UNIVERSITY OF NEW YORK

College of Technology
Farmingdale, NY

Fall 1992 anticipated tenure-track vacancies (4), instructor-assistant professor rank. Teaching responsibilities may include remedial, technical, college level (through differential equations). Teaching emphasized with scholarship and service expected. Minimum qualifications: ABD in pure or applied mathematics, statistics, operations research, or college teaching of mathematics and some college teaching experience. Preferred qualifications: doctorate in one of the above (*required* for assistant professorship). Letter of application and resumé, including the names and addresses of 3 references must be received by **March 27, 1992**. Address correspondence to: Dr. Robert V. Mark, Dean, School of Arts & Sciences, State University of New York, College of Technology, Farmingdale, NY 11735. The College is an Equal Opportunity-Affirmative Action Employer.

MATHEMATICS

The College of the Ozarks invites applications for a position beginning August 24, 1992. Teaching responsibilities include the entire range of the undergraduate mathematics curriculum. A PhD in mathematics is preferred. A record of effective teaching and a commitment to excellence is required. The college, located in southwest Missouri near Branson, is a small liberal arts, work-study college with a commitment to Christian faith and service. Rank and salary commensurate with experience. Please submit letter of application, resumé, and three letters of recommendation to: Dr. Kenton C. Olson, Dean of the College, College of the Ozarks, Point Lookout, MO 65726.

EASTERN ILLINOIS UNIVERSITY

Department of Mathematics
Charleston, IL 61920

We anticipate one or more tenure-track positions to start in fall 1992. Duties include teaching a wide spectrum of computer science courses and some supervision of interns. Excellence in teaching is expected. A PhD either in computer science or mathematics is required, and experience in both is preferred. Applications from minorities and women are encouraged. Send application letter, transcript, and three letters of recommendation to: Ira Rosenholz, Chairperson, by Jan. 1, 1992.

UNIVERSITY OF ST. THOMAS

Faculty Position as
Director of the Center for Applied Mathematics

Nominations and applications are sought for a permanent faculty position in applied mathematics. This appointment, which is expected to lead to tenure, includes a reduced teaching load and the availability of budget supplements for travel and secretarial support. A specific responsibility of the holder of this position is to serve as Director of the Center for Applied Mathematics within the Department of Mathematics. The mission of the Center is the preparation of undergraduates for work in applied mathematics, including opportunities for undergraduate research and for collaboration with the region's business, industry, government, and nonprofit organizations on mathematics problems of real-world interest. The successful applicant for the position will hold a PhD in an appropriate area of mathematics, applied mathematics, or statistics, have an outstanding record of effective work with undergraduate students, be familiar with a range of applications of mathematics in the nonacademic sector, demonstrate good organizational and interpersonal skills, and share a commitment to quality liberal arts education. The salary and rank of appointment will be appropriate for the candidate selected.

The University of St. Thomas, the largest private college or university in Minnesota, is located near the Mississippi River in the heart of the attractive and dynamic Twin Cities metropolitan area. For over a century the university has provided a strong program of liberal arts education in the Catholic tradition of service to the greater community. The Department of Mathematics, with a current faculty of 14 representing a variety of mathematical interests, offers a comprehensive undergraduate program.

Application materials, including a letter of interest, curriculum vitae, and three letters of recommendation (including comments on the applicant's experience and promise in the areas of teaching, applications, and leadership) will be accepted until December 31, 1991 and, thereafter, until the position is filled. Applications, nominations, and inquiries should be sent to: John T. Kemper, Chair, Department of Mathematics, University of St. Thomas, St. Paul, MN 55105. Individuals from both academic and industrial backgrounds whose interests and credentials are compatible with the requirements of the position are encouraged to apply. The University of St. Thomas is an equal opportunity-affirmative action employer.

MILLSAPS COLLEGE

Applications are invited from qualified candidates for a tenure-track position at the assistant professor level beginning August 1992. A PhD in mathematics is required, with a specialization in statistics preferred. Candidates must be committed to outstanding teaching and scholarly activity at a small liberal arts college. A representative of the college will be interviewing at the Baltimore meeting. Send letter of application, vita, transcripts, and three letters or recommendation to

Dr. Robert H. King, Dean
PO Box 150268
Millsaps College
Jackson, MS 39210

The closing date for applications is December 20, 1991 or until the position is filled. Millsaps College is an equal opportunity employer. Women and minorities are particularly encouraged to apply.

DEPAUL UNIVERSITY CHICAGO, ILLINOIS

Announcement of Positions
in Computer Science

De Paul University invites applications for several tenure-track positions in computer science at all levels. The starting date is September 1992. Any area of specialization will be considered; however, persons in telecommunications will be given special consideration. Any applicant should hold a PhD in computer science or a related field, or be a candidate for such a degree. Duties include a six-hour teaching load and research. Tenure details and salary are negotiable. Benefits include TIAA and standard health insurance. US citizenship is not required.

The Department, which offers bachelor's, master's, and doctoral degrees, has over 500 undergraduate majors and over 800 graduate students. Facilities include a VAX 6410, a VAX 11/750, and IBM 4381, a Harris Nighthawk, and an AT&T 3B15. Each faculty office is provided with a high performance workstation connected to the Department's ethernet. In addition, the Department supports laboratories in telecommunications, artificial intelligence, and computer vision and graphics. The Telecommunications Laboratory features an AT&T System 75 PBX switch and a variety of premise equipment. The data communications lab features PCs connected to high ethernet, thin ethernet, and token ring LAN hardware running Novell network operating system software.

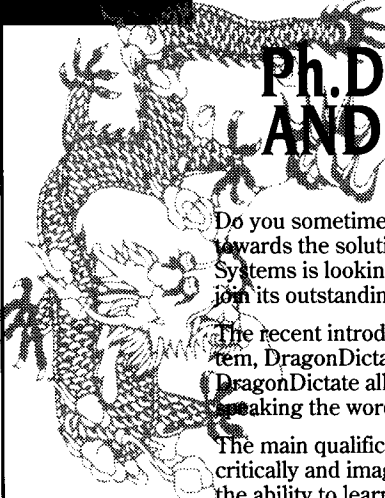
In addition, DePaul has recently joined in the TERN (Telecommunications Education and Research Network) project initiated by the University of Pittsburgh. This will (about a year from now) provide us access to a 45 Mbps network connecting over 20 universities nationwide for telecommunications instruction and research purposes.

The Department's Artificial Intelligence Laboratory is equipped with four Hewlett-Packard AI workstations, two Symbolics 3640s, and a Symbolics 3670. The Department's Computer Vision and Graphics Laboratory is equipped with an AT&T 3B2-1000, various graphics workstations including a Silicom Graphics Personal Iris, assorted graphics terminals including XWindow terminals, two black and white frame grabbers, a 24-bit color frame grabber, and a dedicated vision processor. There are also numerous PC laboratories.

Faculty interests include telecommunications, information systems, artificial intelligence, computer vision, neural computing, natural languages, applied statistics, applied graph theory, computer graphics, computer security, compiler design, semantics of programming languages, and computer architecture.

Applications will be received until positions are filled. To apply, send a resumé and at least three letters of reference to Helmut Epp, Chairman, Department of Computer Science and Information Systems, DePaul University, 243 S. Wabash, Chicago, IL 60604.

DePaul University is an equal opportunity employer.



Ph.D.'s: MATHEMATICS AND PHYSICS

Do you sometimes wish that you could apply your research abilities towards the solution of challenging practical problems? Dragon Systems is looking for creative PhD mathematicians and scientists to join its outstanding staff of researchers.

The recent introduction of Dragon Systems' 30,000 word dictation system, DragonDictate™, has sparked the rapid growth of the company. DragonDictate allows a user to enter text into a word processor by speaking the words.

The main qualifications for a research position are the ability to think critically and imaginatively about scientific and technical issues, and the ability to learn new skills quickly. Dragon will train qualified candidates in the necessary technical areas. Knowledge in the areas of probability and statistics, signal processing and speech science would be useful. Experience with C programming required.

Dragon offers an exciting research environment, which in some ways resembles that found at university academic departments. Interested candidates should address resumes and inquiries to: **Alice Rich, Director, Human Resources, Dragon Systems, 320 Nevada Street, Newton, MA 02160 (617) 965-5200.** Dragon Systems is an Equal Opportunity Employer.

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FRANKLIN & MARSHALL COLLEGE

Dept. of Mathematics
Lancaster, PA 17604-3003

Tenure-track assistant professor position in undergraduate mathematics department starting fall 1992. PhD expected by Sept. 1992. Teaching: three courses per semester; change to five courses per academic year in progress. Commitment to continued scholarly activity expected. Send resumé, graduate and undergraduate transcripts, and three letters of recommendation, one or more of which address teaching ability, to: A. D. Feldman, Chair, by Feb. 1, 1992. Franklin and Marshall College is committed to cultural pluralism and strongly encourages applications from minorities and women. EOE/AA.

FRANKLIN & MARSHALL COLLEGE

Dept. of Mathematics
Lancaster, PA 17604-3003

Position in undergraduate mathematics department starting fall 1992, renewable for a total of three years. PhD expected by Sept. 1992. Teaching: three courses per semester; change to five courses per academic year in progress. Send resumé, undergraduate and graduate transcripts, and three letters of recommendation, one or more of which addresses teaching ability, to: A. D. Feldman, Chair. Applications will be considered starting March 1, 1992, and will be accepted until position is filled. Franklin and Marshall College is committed to cultural pluralism and strongly encourages applications from minorities and women. EOE/AA.

MATHEMATICS

The Department of Mathematical Sciences invites applications for a tenure-track assistant professor level position beginning in fall 1992. Applicants should have a PhD in mathematics with an interest in computing science. Preference will be given to candidates specializing in algebra or discrete mathematics. We seek a person who will play an active role in bringing technology into the instruction of mathematics. Scholarly activity is expected.

The successful candidate will teach mostly undergraduate mathematics with some computer science. The teaching load is three courses per semester and classes typically meet three hours per week. The department has about twenty senior majors per year, many of whom go to graduate school in the mathematical sciences.

Ohio Wesleyan University is a private university with approximately 1,900 undergraduate students. We are located within 25 miles of Ohio State University. The Department of Mathematical Sciences has seven full-time faculty members. Computing facilities are up-to-date.

Applications close February 28, 1992. Send cover letter, resumé, official graduate and undergraduate transcripts, and three letters of reference to:

Professor David L. Hull, Chair
Department of Mathematical Sciences
Ohio Wesleyan University
Delaware, OH 43015

Ohio Wesleyan University strongly encourages applications from qualified female and minority candidates. Ohio Wesleyan is an Equal Opportunity Affirmative Action Employer.

NORTH LAKE COLLEGE

member of the
**DALLAS COUNTY
COMMUNITY COLLEGE DISTRICT**

North Lake College, a comprehensive community college, is accepting applications for an instructor to teach developmental and academic transfer mathematics courses. This is a full-time position starting in the fall of 1992 with the option of summer employment. Applicants must have a master's degree including 18 graduate hours of mathematics. Duties include designing and implementing quality mathematics programs to improve student participation and success, along with participating in college, division, department, and professional activities. North Lake College is committed to affirmative action and strongly encourages applications from minorities and women. Send resumé, all transcripts, and three professional letters of reference to Dr. Grady Grizzle, Chairman of Humanities, Mathematics, and Technology, 5001 N. MacArthur Blvd., Irving, Texas 75038-3899; (214) 659-5320. Applications should be received by December 31, 1991.

**ROSE-HULMAN
INSTITUTE OF TECHNOLOGY**

Department of Mathematics

Applications are invited for two or more tenure-track positions at the assistant or associate professor level for the fall of 1992. Applicants should have a PhD in mathematics or statistics, and a strong commitment to scholarship and to teaching at the undergraduate level. Candidates with a background in statistics, operations research, and/or applied mathematics are especially encouraged to apply. Send letters of application, resumé, copy of transcript, and three letters of recommendation (with at least one of them addressing the applicant's teaching ability) to: George Berzsenyi, Chairman, Department of Mathematics, Rose-Hulman Institute of Technology, Terre Haute, IN 47803.

Rose-Hulman Institute of Technology is an equal opportunity employer.

SAN JOSE STATE UNIVERSITY

An opening for assistant professor (higher rank in an exceptional case) in mathematics education to start in August 1992. Candidates must have earned doctorate, preferably in mathematics education. Preference will be given to candidates who have precollege teaching experience and a master's degree in mathematics (or the equivalent). Significant professional activity is required for eventual tenure consideration. Salary for assistant professors is between \$36,400 and \$43,900 per annum. Application deadline is January 2, 1992. Applicants should send vita, transcripts, and three letters of recommendation to: Dr. Veril Phillips, Department of Mathematics and Computer Science, San Jose State University, San Jose, CA 95192-0103. EOE/AEE.

SUNY-GENESEO

Mathematics Department
Geneseo, New York 14454

Position available September 1992 (subject to budgetary approval). Assistant professor, two-year, tenure-track. Qualifications: PhD, teaching experience, scholarly growth. Send resumé, three letters of recommendation, transcripts to: Donald Trasher, Chair. Closing date: February 1, 1992. (AA/EOE) Women and minorities are encouraged to apply.



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CALIFORNIA STATE POLYTECHNIC UNIVERSITY

The Department of Mathematics in the College of Science invites applications and nominations for the position of chair of the mathematics department. Doctorate in mathematics, statistics, math education, or equivalent degree. Record of successful administrative, teaching and scholarly research required. Evidence of commitment to promoting teaching, research, and other scholarly activities. Application, resumé, transcripts, and three current letters of reference to be received by 1/15/92. For additional information or to apply, contact: Search Committee, Mathematics Department, California State Polytechnic University, 3801 W. Temple Ave., Pomona, CA 91768-4033; (714) 869-3467. EOE/AA.

CHAIRPERSON

Department of Mathematics
Illinois State University

The Department of Mathematics at Illinois State University invites applications for the position of chairperson at the rank of professor. Qualifications: Applicants must have a doctorate in mathematics or mathematics education and a solid record of achievement in research, teaching, and leadership. They must have demonstrated effective administrative skills. Experience with undergraduate and graduate programs is desirable. The salary is competitive. Duties begin on or about August 1, 1992.

The Department: The ISU Department of Mathematics has 44 full-time faculty positions and offers undergraduate, master's and doctoral programs (Doctor of Arts in mathematics and PhD in mathematics education). Current faculty research interests include various areas of mathematics, applied mathematics, statistics, and mathematics education. The department serves over 4,000 students each semester.

Application Procedures: To ensure consideration, applicants should send a letter of application, a complete vita, graduate transcript(s), and names and addresses of at least 3 references to Dr. Robert Corbett, Secretary, Mathematics Chair Search Committee, Department of Geography-Geology, Illinois State University, Normal, IL 61761, before **February 14, 1992**. Illinois State University is an Equal Opportunity-Affirmative Action Employer.

ALFRED UNIVERSITY

Applications are invited for a tenure-track position beginning August 1992. We seek a PhD mathematician who is committed to excellent teaching of undergraduates, will maintain active scholarship, and is willing to contribute to divisional and university activities. The area of expertise is open, but the ability to teach in an area of modern applied mathematics, such as modeling, is desirable.

Send letter of interest, curriculum vitae, graduate transcripts, and three letters of support to: Dr. Robert Williams, Division of Mathematics and Computer Science, Alfred University, Alfred, NY 14802; rwilliams@alfredu.bitnet. We will be represented at the AMS-MAA meetings in Baltimore.

We particularly encourage women and minority applicants. Alfred University is an Equal Opportunity Employer.

Review of applications will begin **January 24, 1992**.

FERRIS STATE UNIVERSITY

Head, Department of Mathematics

Ferris State University invites nominations and applications for the position of Head of the Department of Mathematics. The 25-member department is primarily responsible for undergraduate education in mathematics and computer science. In addition to its fundamental service role, a newly approved actuarial science program and emerging programs in applied mathematics and mathematics education are offered. QUALIFICATIONS: doctorate (or near) in mathematics or in applied mathematics; or doctorate (or near) in mathematics education with a master's in mathematics; professional development and teaching experience appropriate to associate professor or higher rank; ability to work with faculty and students in a broad array of disciplines in a career-oriented undergraduate setting; demonstrated personal qualities of integrity, industriousness, leadership, organization, and interpersonal and motivational skills.

Ferris State University is an applied polytechnic university providing career-oriented education to over 12,400 students in a state-funded teaching university situated in west central Michigan. More than 120 undergraduate programs and selected graduate and professional degrees are offered through its Colleges of Allied Health, Arts & Sciences, Business, Education, Optometry, Pharmacy, and Technology.

Review of applications will begin **December 1, 1991** and will continue until the position is filled. Letter of interest, vita, official transcripts, and three letters of reference should be sent to: Professor George Wales, Search Committee Chair, c/o Dean, College of Arts and Sciences, Ferris State University, Big Rapids, MI 49307. EO/AE.

MATHEMATICS

Potsdam College of the State University of New York invites applications for one possible tenure-track position in mathematics commencing September 1, 1992. Responsibilities: Teach, at most, 12 hours/semester of undergraduate and beginning graduate mathematics. Qualifications: PhD in mathematics (any area). Near completion of ABD will be considered. Salary: Commensurate. Send letter of application, resumé, graduate transcripts (copies are acceptable), and letters of reference to: Dr. K. Chapman, Search Committee Chair, Department of Mathematics, Potsdam College, Potsdam, NY 13676. Application review will commence **February 1, 1992** and continue until the position is filled. Potsdam College is an equal opportunity-affirmative action employer committed to excellence through diversity.

SAM HOUSTON STATE UNIVERSITY

Mathematics Education Position

The Division of Mathematical and Information Sciences seeks applicants for a tenure-track assistant or associate professorship in mathematics education. Doctorate in mathematics or mathematics education is required. Preference will be given to persons with a strong background in mathematics and a record of (or potential for) leadership in mathematics education. Women and minority candidates are encouraged to apply. Review begins **1 December 1991** and continues until the position is filled. Send a letter of application, vita, transcripts, and three letters of reference to: Dr. John C. Huber, Mathematics Education Search, Sam Houston State University, Huntsville, TX 77341-2206. SHSU is an Equal Opportunity, Affirmative Action Employer.

Department of Mathematical Sciences THE JOHNS HOPKINS UNIVERSITY

Applications are invited for a faculty position in

OPERATIONS RESEARCH or OPTIMIZATION

to begin in fall 1992. Within these areas, either a stochastic or a deterministic emphasis is of interest. Applications at all levels will be considered.

Selection is based on demonstration and promise of excellence in research, teaching, and innovative applications. AA/EOE.

Applicants are asked to furnish a curriculum vitae, transcripts (junior applicants only), reprints (if available), a letter describing professional interests and aspirations, and to arrange for three letters of recommendation to be sent to:

John C. Wierman, Chair
Department of Mathematical Sciences
220 Maryland Hall
The Johns Hopkins University
Baltimore, MD 21218-2689

BOSTON COLLEGE

Department of Mathematics
Chestnut Hill, MA 02167

Applications are invited from qualified candidates for a tenure-track position at the assistant professor level, beginning in the fall of 1992. Preference will be given to applicants in probability and statistics, combinatorics, discrete mathematics, and numerical analysis, but all qualified applicants will be considered. Applicants should submit a curriculum vitae and at least three letters of recommendation should be sent to the attention of the Chair, Search Committee, on or before **January 3, 1992**. Boston College is an Equal Opportunity/Affirmative Action Employer. Women and minorities are particularly encouraged to apply.

PHILLIPS ACADEMY Andover, MA 01810

Department of Mathematics

Phillips Academy, an independent, national and international residential high school for 1,200 able, college-bound students, maintains high academic standards. Approximately 70% of the faculty hold MA and PhD degrees. The school desires and supports a multicurriculum and a diverse faculty.

The Mathematics Department seeks a highly energetic teacher with a master's or doctor's degree who enjoys working with students and who wants to teach algebra, geometry, calculus, and discrete math, as well as think about curricular questions and how to use computers in the teaching of math. A small number of the most advanced students take mathematics through vector calculus and linear algebra. Applicants need to be enthusiastic about living in a residential school that thrives on the challenges of diversity. Teaching at Andover includes advising student activities and coaching sports at an appropriate level.

Applicants should submit a resumé and a letter outlining how they foresee contributing to the school. Letters should be addressed to the Dean of Faculty. (EOE)

WESTERN CAROLINA UNIVERSITY

Department of Mathematics
and Computer Science

Tenure-track position at the rank of assistant-associate professor, starting fall 1992. PhD in mathematics required. Duties include teaching undergraduate courses in mathematics and graduate courses in a master's program in applied mathematics. Excellence in teaching and continued scholarly activity are expected. Applicants should possess the ability to teach in English effectively. Send resumé, copies of transcripts, and three letters of reference to: E. L. Morton, Search Committee, Department of Mathematics and Computer Science, Western Carolina University, Cullowhee, NC 28723.

Application deadline: **January 31, 1992**; however, applications will be accepted until the position is filled. An Equal Opportunity-Affirmative Action Employer.

**STATE UNIVERSITY COLLEGE
AT CORTLAND**

Two assistant professors (mathematics). These are tenure-track positions. These positions entail teaching a variety of mathematics courses each semester, from the elementary to the upper-division level, as well as taking part in departmental governance and student advisement. A doctorate in mathematics and evidence of strength in, and commitment to, undergraduate education is required. An interest in the preparation of secondary mathematics teachers will be valued, as well as research potential in mathematics or mathematics education. All areas of specialization in mathematics or mathematics education are encouraged to apply. Applications for the position will be accepted until **January 31, 1992**. AA/EEO Employer.

Applicants should submit a letter of application, vita, three letters of recommendation, and all transcripts to:

Dr. Jalal Alemzadeh, Chair
Search Committee of Mathematics Department
State University of New York
College at Cortland
PO Box 2000
Cortland, NY 13045

**MATHEMATICS
DEPARTMENT FACULTY**

Tenure-track, full-time position available beginning fall semester, 1992. Faculty rank negotiable.

Duties include teaching an average of twelve (12) semester hours of undergraduate mathematics courses per semester and participating in department activities.

PhD in mathematics and college mathematics teaching experience required. Minorities and women are especially encouraged to apply.

Send letter of application, resumé, transcripts, and three (3) current letters of recommendation to:

Search Committee, Chairperson
Mathematics Department
Slippery Rock University
Slippery Rock, PA 16057

To ensure consideration, application materials should be received by **January 31, 1992**. Applications will be accepted until the position is filled.

SLIPPERY ROCK UNIVERSITY IS AN AFFIRMATIVE ACTION/EQUAL OPPORTUNITY EMPLOYER.

SCHOOL OF MATHEMATICS

University of Minnesota

Temporary Assistant Professor. Mathematics and mathematics education, for recent PhDs interested in working with mathematically gifted secondary school students. This position is a 9-month appointment in the School of Mathematics, nontenure-track, 2-year initial period, renewable for up to 2 additional years. Work under the supervision of the Director of the Special Projects Office of the School primarily with the University's Talented Youth Mathematics Program (UMTYMP). Projected salary \$30,000–32,000 for the academic year depending on qualifications. Summer appointments on externally funded projects may be available. **Responsibilities:** Teaching departmental coursework, programs, and activities which are educationally innovative. Conduct research with the director leading to the publication of articles and materials related to these programs. **Qualifications:** PhD degree in mathematics with research publications, teaching experience at the undergraduate level required. Research and publication experience in educationally related programs desirable. Experience with undergraduate curriculum development or innovative educational programs for talented secondary school students of undergraduates desirable. Send curriculum vitae, 3 letters of recommendation (including at least one letter on teaching experience and educational involvement), statement of interest, and background to: Dr. Harvey Keynes, School of Mathematics, University of Minnesota, 206 Church Street SE, 127 Vincent Hall, Minneapolis, MN 55455. **THE UNIVERSITY OF MINNESOTA IS AN EQUAL OPPORTUNITY EDUCATOR AND EMPLOYER.**

MURRAY STATE UNIVERSITY

Department of Mathematics & Statistics

Applications are invited for a tenure-track position at the assistant-associate professor level beginning August 1992.

Responsibilities include a maximum three course teaching load, continuing research-scholarly activities, and university-departmental service. Qualifications include a PhD in mathematics or statistics and research interests which coincide with those of the current department faculty. Present research interests include algebra, operator theory, functional and numerical analysis, differential equations, topology, statistics, and mathematics education. While specialists in any field may apply, preference will be given to applicants in statistics and mathematics education. Salary will be competitive. Screening will begin **January 13, 1992** and continue until the position is filled.

Applicants must meet federal guidelines for working in the US.

Send a letter of application with vita, copies of undergraduate and graduate transcripts, and direct three letters of recommendation to:

Dr. Robert Pervine, Search Committee Chair
Department of Mathematics & Statistics
Murray State University
Murray, KY 42071

Murray State University does not discriminate on the basis of race, color, national origin, sex, or handicap in its programs and activities. The following person has been designated to handle inquiries regarding the university's nondiscrimination policies: Dr. Doreen Rauch, Director of Affirmative Action, 318 Wells Hall, Murray State University, Murray, KY 42071; (502) 762-3155.

FURMAN UNIVERSITY

Greenville, South Carolina 29613

The Department of Mathematics at Furman University, an undergraduate, liberal arts college, invites applications for a tenure-track assistant professorship beginning September 1, 1992. A PhD in a mathematical science is required. All areas of specialization are acceptable. Excellence in teaching and continued scholarly activity are expected of all faculty. The application should address the candidate's interest in a position at a liberal arts college and plans for an ongoing program of scholarly activity. A vita, graduate and undergraduate transcripts, and three letters of recommendation should be sent to Robert Fray, Department of Mathematics. At least one of the letters should discuss the applicant's teaching ability. Application deadline: **January 24, 1992**. EOE/AEE.

UNIVERSITY OF ARIZONA

Graduate Fellowships in the
Mathematical Sciences

Up to 12 fellowships for outstanding new graduate students in the mathematical sciences may be available in 1992–93. Fellowship applicants should be seeking the PhD and planning careers in teaching and/or fundamental research. Anticipated stipends are \$12,000 or more for 12 months with both in-state and nonresident tuition waived.

These fellowships are restricted to citizens, permanent residents, or individuals who have established intent to become citizens or permanent residents of the United States. Applications from US women and students belonging to US minority groups are particularly invited. Currently one-fourth of the US graduate students in pure and applied mathematics at Arizona are women.

The University of Arizona has excellent programs in traditional pure and applied mathematics and is a leading institution in interdisciplinary applied mathematics. This presents a wealth of opportunities for graduate study encompassing such areas as dynamical systems, number theory, computational science, geometry, nonlinear partial differential equations, mathematical physics, probability, and applications of mathematics in the physical, biological, social, and engineering sciences. In addition, outstanding computational facilities for graduate study and research are available to the over 170 graduate students in the mathematical sciences at the University of Arizona.

Fellowship applicants of superior quality will be among the students invited to the Sixth Annual Workshop for Advanced Undergraduates on Current Ideas in Nonlinear Science, February 29–March 3 1992. Limited support is available for attendees. (*The deadline for Workshop applications is February 1, 1992.*) The workshop is designed to communicate topics in current active research in three areas: (i) Geometrical and Computational Aspects of Analysis and Number Theory; (ii) Analytical Approaches to Applied Problems; and (iii) Numerical Modeling.

For information and application materials, contact:

W. M. Greenlee or T. W. Secomb
Department of Mathematics
Program in Applied Mathematics
University of Arizona
Tucson, AZ 85721
(602) 621-2068

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LORAS COLLEGE

Mathematics and Computer Science
Dubuque, IA 52004-1078

Applications are invited for a tenure-track position in mathematics at the assistant or associate professor level beginning in fall 1992. Requirements include a strong interest in teaching and promoting mathematics in an undergraduate liberal arts program. A PhD in mathematics or statistics is preferred. Responsibilities include teaching an average of 12 credit hours per semester; helping to provide initiative and enthusiasm in modifying and/or developing courses and other departmental academic programs; advising students; and service on college and department committees. Full consideration will be given to applications received by **February 1, 1992**. Send letter of application, vita, transcripts, and three references to Dr. Larry Zettel, Chair. (AA/EOE.)

UNIVERSITY OF SOUTH CAROLINA

Department of Mathematics

The Department of Mathematics invites applications for expected tenure-track faculty positions for fall 1992, at all ranks. Applications in all areas of mathematics will be considered. Research is supported by excellent inhouse library and computing facilities. The PhD degree or its equivalent is required. Appointments will be consistent with the department's commitment to excellence in research and in teaching at the undergraduate and graduate levels. A detailed resumé, containing a summary of research accomplishments and goals, and four letters or recommendation should be sent to:

Dr. George F. McNulty, Chairman
Department of Mathematics
University of South Carolina
Columbia, SC 29208

The University of South Carolina is an Affirmative Action/Equal Opportunity Employer.

MILLERSVILLE UNIVERSITY

Full-time, tenure-track assistant professorship to begin August 1992, in a department of 20 faculty and over 225 math majors. Primary duties: leadership in developmental mathematics, diagnostic techniques, remediation, delivery packages, teaching and placement, teaching through calculus, advisement, curriculum development, committees, and scholarly growth. Twelve-hour load per semester. Doctoral degree (or expected completion within one year) in mathematics, math education, or curriculum and instruction with a mathematics background at least through the master's level. Must exhibit evidence of strong commitment to excellence in teaching developmental mathematics, relate well with developmental students and the wider university community, and be an effective teacher of math through calculus. Experience in preuniversity or urban teaching preferred. Excellent salary-benefits. Full consideration will be given to applications received by **2/1/92**. Send letter of application, vita, copies of transcripts, and three letters of reference (at least two which attest to your teaching effectiveness) to: Prof. Marshall Anderson, Staff Search Committee Chair, Department of Mathematics/F1291, MILLERSVILLE UNIVERSITY, Millersville, PA 17551. AA/EOE.

AUSTIN PEAY STATE UNIVERSITY

Mathematics and Computer Science Department. Tenure-track positions. Doctorate preferred. Teaching, advisement, program development, and scholarly activities. Mathematics or mathematics education. Application review will begin in **December** and will continue until filled. Send letter of application, resumé, transcripts, and three letters of reference to: Dr. Leon McQueen, Box 4626, APSU, Clarksville, TN 37044.

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FAIRFIELD UNIVERSITY

Dept. of Math & Comp. Science
North Benson Rd. Fairfield, CT 06430-7524

Asst. prof. math; tenure-track; 9 hours teaching per week plus research; start Sept. 1992. PhD required with teaching competence in statistics desirable. Salary competitive; full consideration until **Feb. 1, 1992**. Vita and 3 letters of reference to: Joseph B. Dennin, Chair of Department. An equal opportunity employer. Fairfield is a Jesuit university, 60 minutes from New York City.

PENN STATE HARRISBURG

The mathematical and computer science program of Penn State Harrisburg solicits applications for a tenure-track position in STATISTICS. A PhD in statistics or a related field is required. A specialization in one or more of the following areas is preferred: linear and nonlinear regression, experimental design, industrial engineering, and quality control. Evidence of teaching effectiveness and an interest in developing externally funded research are expected. Promotion and tenure criteria include teaching effectiveness, research, scholarship, and service. Penn State Harrisburg, an upper division and graduate college with an enrollment of approximately 2,000 undergraduate and 1,500 graduate students, is located in a suburban setting near the state capital. The program offers undergraduate degrees in mathematical sciences, service courses for undergraduate and graduate students in engineering, business, and education. Send resumé, copies of college transcripts, and three letters of reference by **15 January 1992** to Dr. Clifford Wagner, c/o Sandra Jackson, Statistics Search Committee, Box MA, Penn State Harrisburg, 777 W. Harrisburg Pike, Middletown, PA 17957-4898. AN AFFIRMATIVE ACTION-EQUAL OPPORTUNITY EMPLOYER. WOMEN AND MINORITIES ARE ENCOURAGED TO APPLY.

Calendar

National MAA Meetings

- 8–11 January 1992** Seventy-Fifth Annual Meeting, Baltimore, Maryland (Board of Governors, 7 January 1992)
13–16 January 1993 Seventy-Sixth Annual Meeting, San Antonio, Texas (Board of Governors, 12 January 1993)
15–19 August 1993 Sixty-Eighth Summer Meeting, Vancouver, British Columbia (Board of Governors, 14 August 1993)
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Sectional MAA Meetings

- Allegheny Mountain** Slippery Rock University, Slippery Rock, Pennsylvania: 10 and 11 April 1992
Eastern Pennsylvania and Delaware Messiah College, Grantham, Pennsylvania: 4 April 1992
Florida University of North Florida, Jacksonville, Florida: 6 and 7 March 1992
Illinois North Central College, Naperville, Illinois: 24 and 25 April 1992
Indiana University of Indianapolis, Indianapolis, Indiana: 11 April 1992
Intermountain Weber State University, Ogden, Utah: 10 and 11 April 1992
Iowa Graceland College, Lamoni, Iowa: 24 and 25 April 1992
Kansas Hesston College, Hesston, Kansas: 20 and 21 March 1992
Kentucky Bellarmine College, Louisville, Kentucky: 27 and 28 March 1992
Louisiana and Mississippi Louisiana State University, Baton Rouge, Louisiana: 6 and 7 March 1992
Maryland-District of Columbia-Virginia University of Virginia, Charlottesville, Virginia: 24 and 25 April 1992
Metropolitan New York Webb Institute of Naval Architecture, Glen Cove, New York: 3 May 1992
Michigan Saginaw Valley State University, University Center, Michigan: 8 and 9 May 1992
Missouri Northwest Missouri State University, Maryville, Missouri: 10 and 11 April 1992
Nebraska Hastings College, Hastings, Nebraska: 10 and 11 April 1992
New Jersey The Center for Discrete Mathematics and Theoretical Computer Science (DIMACS), Rutgers University, New Brunswick, New Jersey: 28 March 1992
Northeastern Merrimack College, North Andover, Massachusetts: 5 and 6 June 1992; Trinity College, Hartford, Connecticut: 20 and 21 November 1992

- Northern California** University of the Pacific, Stockton, California: 29 February 1992
Ohio University of Dayton, Dayton, Ohio: 27 and 28 March 1992
Oklahoma and Arkansas Henderson State University, Arkadelphia, Arkansas: 3 and 4 April 1992
Pacific Northwest University of Montana, Missoula, Montana: 18–20 June 1992
Rocky Mountain Colorado College, Colorado Springs, Colorado: 10 and 11 April 1992
Seaway Queen's University, Kingston, Ontario, Canada: 1 and 2 May 1992; Cornell University, Ithaca, New York: 6 and 7 November 1992
Southeastern Kennesaw College, Marietta, Georgia: 10 and 11 April 1992
Southwestern University of Arizona, Tucson, Arizona: Spring 1992
Texas University of Houston-Downtown, Houston, Texas: 9–11 April 1992
Wisconsin University of Wisconsin at Whitewater, Whitewater, Wisconsin: 24 and 25 April 1992
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Other Meetings

- 29 December 1991–2 January 1992** *First International Conference on Post High School Technical Education*, Jerusalem-Tel Aviv, Israel. An opportunity to discuss new programs and solutions to problems common to technical education throughout the world. Conference cochair Jakob Hecht of the Israel Ministry of Labour and Social Affairs invites topic suggestions and invited speaker nominations. For additional information, contact: ISAS, PO Box 574, Jerusalem 91004, Israel.
- 6–11 February 1992** *Annual Meeting of the American Association for the Advancement of Science (AAAS)*, Chicago, Illinois. (For additional information, see page four of this issue of FOCUS.)
- 29–31 March 1992** *Fifteenth Annual Symposium on Developmental Education*, The Nevele Country Club, Ellenville, New York. Sponsor: the New York College Learning Skills Association. For additional information, contact: Barbara Risser, Department of English, Onondaga Community College, Route 173, Syracuse, New York 13215; (315) 469-7741, ext. 2424.
- 3–5 April 1992** *1992 Annual Conference of the New York State Mathematics Association of Two-Year Colleges (NYSMATYC)*, The Nevele Hotel, Ellenville, New York. For additional information, contact: Richard Rupprecht, Jamestown Community College, 525 Falconer Street, Jamestown, New York 14701.

FOCUS

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Washington, DC 20036-1385

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