

# FOCUS

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## Yet Another Calculus Conference?

Barry Cipra and Paul Zorn

Michael Reed remained discreetly silent when the airport limo driver asked if any of her passengers were mathematicians. The driver explained that her previous passengers had all been mathematicians on their way to a calculus conference.

"Calculus," the driver said. "Can you imagine anything so *boring*?"

The limo driver's opinion is widely shared by nonmathematicians, including many for whom calculus is a necessity. For that matter, it is an attitude not uncommon within the mathematics profession. Calculus is often described as the bread and butter of a department but seldom as the cinnamon toast or Belgian waffle. Professors who refer to teaching calculus as a piece of cake usually have something stale and dry in mind.

But a growing number of mathematicians—including research mathematicians of the first rank—are coming to calculus with fresh ideas and renewed interest. The National Science Foundation in turn is renewing its commitment to undergraduate mathematics. A new NSF program in the Undergraduate Science, Engineering, and Mathematics Education (USEME) Division of the Science and Engineering Directorate focuses on calculus as the gateway—also known as the chokepoint—to careers in science and engineering.

Reed, a mathematics professor at Duke University, was on his way to a calculus conference: a one-day workshop bringing together representatives from 25 projects recently funded by the NSF's new Undergraduate Curriculum Development in Mathematics Program-Calculus. The grants, announced in September, total \$1.29 million in NSF money with another \$0.75 million from the institutions involved. The 25 awards consist of five multi-year projects, 19 one-year planning grants, and one series of conferences. A listing of these projects follows this article.

The one-day workshop, held October 24, was hosted by the Institute for Mathematics and Its Applications (IMA) at the University of Minnesota. Nearly 100 participants heard panel discussions on the relationship of calculus to other disciplines, the possibility of including research topics in calculus courses, and the prospects for attracting mathematics majors through improving the calculus curriculum. Just as important as the formal program, says NSF Program Director John Kenelly, was the chance for participants to meet each other and learn about each other's projects.

*(Calculus Conference continued on page 2)*

## More Mathematical Science Doctorates Awarded in 1988: Fewer Go to US Citizens

The highlights of the 1988 annual AMS-MAA survey show a continuation of existing trends in PhD's in the mathematical sciences.

US institutions awarded 804 doctorates in these areas in the July 1, 1987 to June 30, 1988 period, with Canadian institutions awarding 52 degrees in these areas in the same period. The total of 856 doctorates was an increase by 7% over the average of the fall counts for the last five years. Males accounted for 703 or 82% of these degrees.

The US total of 804 was up 25 from the total in the 1986–1987 academic year, but several hundred below the annual number of degrees awarded in the early 1970's.

Only 363 or 45% of the doctorates awarded by US institutions went to US citizens. This percentage has steadily declined since the late 1970's, when three quarters of the doctorates awarded by US institutions went to US citizens. For the second consecutive year the number of doctorates awarded to US citizens is well below 400. The sum total of US citizen new doctorates for the last two years (735) is less than the total for the single year 1974–1975 (741).

Although women comprise 21% of the US citizens receiving doctorates, only 16% of the new doctorate hires in the US doctorate-granting departments were women.

Starting salaries for new doctorates increased by 4.6% over last year for those reporting nine-month teaching (or teaching and research) positions.

The initial detailed report of this joint AMS-MAA data collection is given in the November 1988 issue of NOTICES OF THE AMS and reprints of the completed report are available from Monica Foulkes, P.O. Box 6248, Providence, RI 02940; telephone (401) 272-9500.

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American Mathematics Project pages 10–11

(*Calculus Conference continued from front page.*)

Kenelly also emphasized the need for public visibility for the calculus movement. Limo drivers notwithstanding, there is interest in mathematics out there. Kenelly notes that the previous Sunday's PARADE magazine—the nation's largest-circulation periodical—had run a short article on the vanishing mathematics major. Mathematics in general, and the calculus initiative in particular, need more such press coverage.

The impetus for calculus reform is the growing realization, both mathematics department and in client disciplines, that the traditional calculus course, like many of the students who take it, is failing. "The students we get in engineering don't have the facility we'd like to see," said panelist Rutherford Aris, a chemical engineer at the University of Minnesota. "When we teach a control course . . . we have to stand on our heads to get across a . . . real understanding. It shouldn't necessary in a student's third year."

Several of the NSF-supported projects address this issue, by consulting directly with hard-core calculus users. Harvard's project, led by Andrew Gleason and Deborah Hughes Hallett and including mathematicians from six other colleges and one high school, will interview both faculty in client disciplines and people in industry about the mathematics they need for their work. Richard Yeatts and Joan Hundhausen, both at the Colorado School of Mines, are team teaching a combined course in calculus and physics. (Yeatts is a physicist, Hundhausen a mathematician.) Their two-semester course is tailored to the School of Mines' engineering program; it features a weekly laboratory/workshop session. Projects at Purdue University, Ithaca College, and Iowa State University, among others, also involve collaboration with other departments.

A common criticism of current calculus courses and texts is that their application problems are artificially simple or pose pointless questions. Better, more realistic applications of calculus are emphasized in several projects. The Five College Consortium (the University of Massachusetts, and Smith, Amherst, Hampshire, and Mount Holyoke Colleges) received a multi-year award to restructure a three-semester calculus sequence around genuine problems in economics, biology, and physics. Part of another project, involving 25 liberal arts colleges in the Midwest, is to write expository application modules that are "deep enough to give genuine insight into the field." This group, headed by Wayne Roberts at Macalester College in Minnesota, will also work with an interdisciplinary advisory board to produce a collection of textbook-type problems with an applied slant.

Another national problem for calculus is that, as in other mathematics and science courses, minorities and women are underrepresented. At a panel discussion sponsored by the Association for Women in Mathematics last August in Providence, panelist Vivienne Malone-Mayes of Baylor University was able to name every black woman who had received a PhD in mathematics in the United States prior to 1970. There were eight. A planning grant to Spelman College in Atlanta will support a thorough rethinking of the calculus curriculum and methodology, with special attention to problems encountered by women and minorities.

Can research topics play a role in the calculus curriculum? A panel discussion by Andrew Gleason of Harvard, Peter Lax of the Courant Institute, Avner Friedman, Director of the IMA, Gilbert Strang of MIT, and Robert Devaney of Boston University brought out all the opposing points of view. Gleason is skeptical, noting that *all* educational experiments are successful, mainly because of the experimenter's enthusiasm. Devaney, who has received a planning grant to develop a calculus course incorporating ideas from modern dynamical systems, disagrees. There are many unsolved problems based on iteration of simple functions, Devaney points out. Students can ex-

periment with such problems from the very beginning of the course. Strang, who is writing a calculus textbook, notes that he ran into dynamical systems by playing around with Newton's method applied to the function  $x^2 + 1$ . "It was research," Strang joked, "because I had to look up Newton's method."

Students doing research is also the focus of a multi-year project at New Mexico State University. According to David Pengelley, students will discover for themselves important, if perhaps well-known, calculus-related principles and applications, such as the reflecting properties of parabolic mirrors.

Computers figure prominently in much of the thinking about calculus reform. Eight of the NSF-supported projects mention computers or calculators in their titles. The proliferation of microcomputers and powerful software packages for number crunching, graphics, and symbolic manipulation is unquestionably changing the way that scientists and engineers use mathematics. The question facing mathematicians is what role this computational power should play in teaching calculus. Many people feel that computers, especially their graphics capabilities, can deepen students' understanding of the concepts of calculus, in part by freeing them from the tedium of computation.

Doug Child of Rollins College in Florida has received a multi-year grant to develop a Macintosh interface with the computer algebra system *Maple*. Child earlier used *Maple* without an interface, but concluded that "direct use of a computer algebra system by entry level college students . . . would make calculus even more of a filter than it is currently." Child's interface communicates in a more natural mathematical language. For instance, the *Maple* statement " $f := \text{proc}(x) \sin(x-1) \text{end}$ " is replaced by "Define  $f$  by  $f(x) = \sin(x-1)$ ."

To succeed at a nationwide level, Kenelly says, the calculus initiative will require three things: The enthusiastic efforts of teachers, broad support from the research community, and dissemination of ideas and results. A multi-year award to the American Mathematical Society and The Mathematical Association of America in cooperation with The Society for Industrial and Applied Mathematics will promote the third goal. Beginning this March, the AMS will publish a bi-monthly newsletter, UME TRENDS, on undergraduate mathematics education. The newsletter will be edited by Ed Dubinsky of Purdue University. UME TRENDS will be available free of charge for its first two years to all members of the AMS, MAA, SIAM, and AMATYC.

*This article appears by permission of the AMS, which has also published it in its January NOTICES.*

## Calculus Watch

**NSF CALCULUS AWARDS: Multi-Year Grants** The titles, principle investigators, and institutions for the multi-year grants are listed below, together with brief descriptions of the projects.

**CALCULUS IN CONTEXT** James Callahan, Smith College for the Five Colleges, Inc. (see Cipra and Zorn above). To design a three-semester calculus curriculum covering optimization, estimation/approximation, differential equations, and functions of several variables.

**STUDENT RESEARCH PROJECTS IN THE CALCULUS CURRICULUM** Marcus S. Cohen, New Mexico University. Project

aims at course using individual research projects on the mathematical basis of solutions to applied problems.

**A COMPUTER ALGEBRA SYSTEM LINKED TO THE CURRICULUM** J. Douglas Child, Rollins college. Will devise an interface for MAPLE suitable for teaching and learning calculus with the average student.

**INTEGRATION OF CALCULUS AND PHYSICS** Richard Yeatts, Colorado School of Mines. Develop and team teach an integrated calculus and physics course with combined physics laboratory and mathematics workshops.

**UME-NEWS** James A. Voytuk, American Mathematical Society. A collegiate mathematics education newsletter in cooperation with the MAA and SIAM to stimulate better communication.

**NSF CALCULUS AWARDS: One-Year Grants** These are listed below.

**CALCULUS WORKSHOPS AND CONFERENCES** Shaïr Ahmad, University of Miami

**CALCULUS PLANNING PROJECT** Nagambal Shah, Spelman College

**CALCULUS CURRICULUM DEVELOPMENT** Gerald Janusz, University of Illinois, Urbana-Champaign

**CALCULUS, CONCEPTS, AND COMPUTERS** Ed Dubinsky, Purdue University

**PLANNING FOR A REVITALIZATION OF AN ENGINEERING /PHYSICAL SCIENCE CALCULUS** Elgin H. Johnston, Iowa State University

**DYNAMIC CALCULUS** Robert L. Devaney, Boston University

**THE LANGUAGE OF CHANGE: A PROJECT TO REJUVENATE CALCULUS AND INSTRUCTION** Andrew M. Gleason, Harvard University

**CALCULUS REFORM IN LIBERAL ARTS COLLEGES** A. Wayne Roberts, Macalester College

**DEVELOPMENT OF CALCULUS** Lawrence C. Moore, Jr., Duke University

**CALCULUS: RESTRUCTURING AND INTEGRATION WITH COMPUTING** Richard H. Crowell, Dartmouth College

**FROM EUCLID TO VON NEUMANN, AN ACTIVITY-BASED LEARNING EXPERIENCE IN CALCULUS: PROJECT ENABLE** Joan Ferrini-Mundy, University of New Hampshire

**PLANNING A PROBLEM-BASED CALCULUS CURRICULUM** Stephen R. Hilbert, Ithaca College

**CALCULUS AND THE COMPUTER: INNOVATIVE TEACHING AND LEARNING** William E. Boyce, Rensselaer Polytechnic Institute

**TOWARDS A CONCEPTUAL AND CAPTIVATING CALCULUS** Thomas A. Farmer, Miami University, Oxford Campus

**PLANNING FOR CALCULATORS IN THE CALCULUS CURRICULUM** Thomas Dick, Oregon State University

**INTEGRATED CALCULUS DEVELOPMENT** Alain Schremmer, Community College of Philadelphia

**REVITALIZATION OF CALCULUS** Mary McCammon, Pennsylvania State University, University Park

**THE CALCULUS COMPANION: A COMPUTERIZED TUTOR AND COMPUTATIONAL AID** Edmund A. Lamagna, University of Rhode Island

**RESTRUCTURING ONE VARIABLE CALCULUS WITHIN A MODELING AND COMPUTER ORIENTED ENVIRONMENT** Daniel C. Slougher, Furman University

**DEVELOPMENT OF COMPUTER-BASED CURRICULUM MATERIALS FOR CALCULUS: A PLANNING PROJECT** Michael E. Moody, Washington State University.

In fiscal year 1989, the Undergraduate Curriculum Development Program-Calculus will be much the same as in 1988, but new planning grants have been essentially eliminated. The closing date for curriculum development proposals is *February 1, 1989*. Proposals for conferences and workshops may be submitted at any time and require about 6 months processing time. You may contact the program director for calculus curriculum development at the National Science Foundation, Room 639, 1800 G Street, NW, Washington, DC 20550; telephone (202) 357-7051.

**The Future of Calculus** Ithaca College, with assistance from the National Science Foundation, will sponsor this conference on April 15, 1989. Sessions will include contributed papers dealing with teaching calculus and changes in the calculus curriculum. Demonstrations of technology will also be presented. For further information, contact: Professor Stephen Hilbert, Department of Mathematics and Computer Science, Ithaca College, Ithaca, New York 14850. Abstract deadline, February 1, 1989.

## New MAA Program to Help Members Find Employment

The Association is pleased to announce a new membership benefit that can help a member find a job! The program is called MAA-SPEER: for Scientists and Professional Engineering Employment Registry (MSER).

MAA-SPEER, or SPEER (this registry serves a number of scientific and engineering societies), is a computerized resumé data bank used by a large number of businesses and industries that employ scientific and technical workers. MAA-SPEER will complement the Mathematical Sciences Employment Register, which primarily serves the academic community. SPEER is the business and industrial counterpart of MSER.

A participating member will place a resumé in the MAA-SPEER file, using a special SPEER resumé form, obtainable on request. There is NO CHARGE to the member for this service. Participating employers, whose fees cover SPEER's costs, access resúmes through their companies' computers and may select applicant information according to specific training and experience. The SPEER system holds resúmes and applicant addresses in separate secure files so that potential employers cannot discover the applicant's name or current employer; in addition, the applicant's resumé is made invisible to his or her current employer. Once a potential employer has expressed interest in an applicant, SPEER notifies the applicant at his or her home address and the applicant is free to respond to the potential employer. An applicant's resumé remains in the SPEER database at no cost for as long as the applicant wishes. The applicant may review many of SPEER's priority listings using a personal computer and a modem.

If you are an MAA member and you wish to enroll in MAA-SPEER just telephone or write to Career Technologies Corporation (CTS), 138 Old River Road, Andover, Massachusetts 01810; (508) 683-0098. Please specifically mention MAA-SPEER when you call. CTS will send you information and an application form.

## Uncle Sam and the USAMO Personal Reminiscences of Samuel L. Greitzer

Murray S. Klamkin

The first time I met Sam, he, Wilhelm Magnus, and I were the speakers at a high school mathematics teachers meeting in New York City. It was the early 1950's. I was put off by his rather brash manner, but actually his bark was much worse than this bite. My next brush with him was an indirect one in 1966. I was on the editorial panel of the New Mathematical Library and had contributed editorially to his excellent book with H.S.M. Coxeter, *GEOMETRY REVISITED*. I learned quite a bit of geometry from this book, as have many of the USAMO winners, since this book has frequently been awarded as prizes to them. Sam always railed against the poor teaching of geometry in US schools, and I agree with him. This book at least helped the USIMO team members strengthen themselves in geometry, otherwise an area of US weakness.

We next met in 1971; both Sam and I were on the MAA Board of Governors. Henry Alder had called for agenda items for an upcoming Board meeting. I suggested the matter of starting a Mathematical Olympiad. Henry responded by assigning me on an existing subcommittee on this. That subcommittee, chaired by Sam, met at Penn State University. My vote, joining that of Nura D. Turner, long-time Olympiad enthusiast, and other early supporters tipped the balance in favor of starting the Olympiad. I thought that Sam was opposed to the Olympiad. But after the decision, he was gung ho for it and contributed immensely to it as a very strong, forceful, and effective chairman of the committee for many years (up until 1982). He took charge of all the administrative work, including all the letter-writing, telephoning, grading of papers, directing of the training sessions, etc., with part of the costs coming out of his own pocket. At the same time, Nura Turner was a very effective chairman of the awards ceremonies subcommittee. She and Sam were both strong personalities and there were conflicts between them, but in later years these conflicts disappeared. As Chairman of the Olympiad Examination Committee for 14 years, I also had initial difficulties with Sam, but with increasing mutual respect for each other over time, these too disappeared.

Sam was also instrumental in getting the US invited to participate in the IMO and in getting funds for the first two training sessions at Rutgers University where he was teaching at the time. Our first IMO was held in East Berlin in 1974. I was to assist Sam in the coaching, but, unfortunately, my then employer had other plans for me! The US team did excellently, especially for a first-time entry, coming in second. This very strong showing was due both to the quality of the team members and to Sam's coaching. From 1975 to 1980, Sam and I shared the joys and burdens of coaching the team. He was called Uncle Sam (but not to his face!) by the students of the training sessions, since he always maintained a high standard of discipline, which was necessary for these high-spirited youngsters.

In 1981, the IMO was held in the US, the first time outside of Europe. Again Sam was instrumental in this and in getting the necessary NSF funding. At this Olympiad Sam was president of the international jury, and so he very reluctantly had to give up being director of the training session and the coach of the US team. I took over, with my colleague Andy Liu assisting me for the next four years. It was then that I fully realized all the work that Sam had put into directing the training sessions, arranging for travel abroad for the team, and being the leader of the team, etc. In between, he also compiled the book *IMO PROBLEMS AND SOLUTIONS FOR 1959-1977*, an excellent book in the New Mathematical Library se-



Samuel L. Greitzer  
1905-1988

At the 1987 USAMO  
Buffet Dinner  
held at MAA Headquarters.

ries for the MAA. This book too has been awarded many times to the USAMO winners.

Sam contributed greatly to various South American Olympiads by visiting at his own expense and helping to make up the various competitions. He also helped in the start-up of the Australian Olympiad.

Samuel L. Greitzer passed away on February 22, 1988. So 1988 was the first year since 1974 that he did not attend the IMO with the US team. He will be sorely missed by his colleagues and former students here as well as by many of his counterparts in other countries. Although Uncle Sam is gone, he will be remembered for a long time.

## A Start Toward Graduate School The 1989 PDP/Math Summer Program

Leon Henkin and Uri Treisman

To increase the number of minority and women students seeking careers requiring a Ph.D. degree in mathematics, the University of California, Berkeley, will offer a six-week summer program beginning June 19, 1989, for students who will have completed two years of undergraduate mathematics courses beginning with calculus. Support for the program is provided by a grant from the Alfred P. Sloan Foundation.

Students enrolled at any college or university offering a bachelor's degree with major in mathematics, are eligible, provided they will have *completed* the courses described above at some time in the closed interval [May, 1988-June, 1989]. Professors at such institutions are asked to recommend promising students. Each student selected will receive room and board, a stipend of \$2,000, and an allowance for travel to and from Berkeley. Each student will be expected to work intensively in two of the four introductory seminars that will be offered, described below. In addition, there will be weekly colloquium talks by a variety of mathematicians to give a broad view of current work in mathematics.

The areas and the instructor for the four seminars are as follows.

- Algebra, *Professor Efraim Armendariz, University of Texas, Austin*
- Analysis, *Professor Carl Prather, Virginia Polytechnic Institute and State University*
- Discrete Mathematics, *Professor Don Rawlings, Cal Polytechnic State University*

■ *Probability, Professor James Pitman, University of California, Berkeley*

Each seminar will meet for two 2-hour periods weekly. Participants will work, singly and in groups, on lots of hard problems involving the new concepts to which they will be introduced.

The summer program is being organized by Professor Leon Henkin of the Mathematics Department, and Dr. Uri Treisman of the PDP/Dana Center for Innovation in Mathematics Education, both at the University of California. Application forms and further information can be obtained by writing to: PDP/Math Summer Program, 230B Stephens Hall, University of California, Berkeley, CA 94720. First priority will be given to promising students who are Afro-American, Mexican-American, Latino, or Native American; second priority will be given to promising women students from other groups.



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## The Ohio State University Conferences on Technology in Collegiate Mathematics: 1988 and 1989.

Over 300 mathematicians from across the United States attended the three-day conference held October 27–29, 1988 at The Ohio State University in Columbus, Ohio. Registration reached capacity three weeks before the conference and had to be closed early. Among the many conference highlights was a "standing room only" lecture/demonstration of *Mathematica* by its developer Stephen Wolfram of Wolfram Research, Inc. Other well-received lecture were:

- Using Computer Graphics to Enhance the Teaching and Learning of Precalculus Mathematics, *Franklin Demana, The Ohio State University*
- *Maple—An Electronic Blackboard for Mathematics, Stan Devitt, University of Saskatchewan*
- Changes in Pedagogy and Testing When Using Technology in College Mathematics, *John Harvey, University of Wisconsin, Madison, and Alan Osborne, The Ohio State University*
- Getting Started with Symbolic Computation, *Zaven Karian, Denison University*
- Technology in Mathematics: What to Teach and How to Teach It, *Anthony Ralston, SUNY at Buffalo*
- The Twilight of Paper and Pencil: Collegiate Mathematics Between the Centuries, *Thomas Tucker, Colgate University*
- Calculus and *Mathematica*: An Electronic Calculus Textbook, *Jerry Uhl, University of Illinois, Urbana*
- Symbolic, Numerical, and Graphical Computing in Calculus, *Paul Zorn, St. Olaf College*

The closing lecture given by Dr. John Kenelly, Program Director for calculus reform initiatives at the National Science Foundation, provided conference participants with good suggestions about funding sources.

There were 55 contributed papers presented at the conference as well as several "hands on" workshops. The theme of the workshops was "Using technology to enhance the teaching and learning of collegiate mathematics." Workshops included computer based graphing (*Bert Waits*), Calculator based graphing (*Thomas Tucker and Gregory Foley*), *Maple* (*Stan Devitt and Jeanette Palmiter*), *MAT-LAB* (*Tom Ralley*), and *Mathematica* (*Jerry Uhl*).

The Conference Proceedings will be published by Addison-Wesley Publishing Company and will be available to the mathematics community by Spring, 1989. The conference received generous financial support from Addison-Wesley Publishing Company, Apple Computer Inc., Texas Instruments Inc., and the Charles Merrill Publishing Company.

The second annual Ohio State University Conference on Technology in Collegiate Mathematics will be held at Ohio State in Columbus, Ohio on November 2–4, 1989. The registration fee for the 1989 conference is expected to be \$50. For further information, contact: Bert Waits, 1989 Technology Conference, Department of Mathematics, The Ohio State University, 231 West Eighteenth Avenue, Columbus, OH 43210.

## MAA Section Workshops

**Chaos and Decision Making:** The Maryland-District of Columbia-Virginia Section June Workshops. Two 5-day workshops, for college teachers and sponsored by the MD-DC-VA Section, will be given at Salisbury State University on the Eastern Shore of Maryland this June. This is the fourteenth year the Section has sponsored workshops.

- Chaos and the Microcomputer, June 5–9, 1989, will be given by Celso Grebogi of the University of Maryland, College Park.
- Decision Making and the Microcomputer, June 12–16, 1989, will be given by T.L. Saaty of the University of Pittsburgh.

The first workshop will make operational the important and fascinating concept of chaos. The lecturer's main interests are chaos theory and its applications.

The second workshop provides a mathematical basis for making decisions. The method, Analytic Hierarchy Process, has been developed and disseminated by its creator, T.L. Saaty.

The cost for each five-day workshop, including room and board, is \$235. For further information, contact: Dr. B.A. Fusaro, Department of Mathematical Sciences, Salisbury State University, Salisbury, MD 21801; (301) 543-6471 or 6470.

**A Workshop in Mathematical Modeling:** The Allegheny Mountain Section June Short Course. A five-day short course, sponsored by the Allegheny Mountain Section, will be given at Allegheny College in Meadville, Pennsylvania, June 19–23, 1989. Frank Giordano of the U.S. Military Academy, and Maurice Weir of the Naval Postgraduate School will lecture on teaching modeling to undergraduates, graphical models, proportionality, using the computer in modeling, model fitting and optimization, empirical models, dimensional analysis, simulation, and modeling using derivatives and systems of ordinary differential equations.

The cost for this five-day short course is approximately \$115 for tuition and \$80 for single-occupancy dorm room and meals. For more information, contact: Richard McDermot, Department of Mathematics, Allegheny College, Meadville, Pennsylvania 16335, (814) 332-3393; or Dave Wells, Department of Mathematics, Pennsylvania State University, New Kensington, Pennsylvania 15068, (412) 339-7561.

## The MAA Notes Series: Purpose, Potential, and Promise

Warren Page, Chairman, MAA Notes Series Editorial Board

This series, started in 1982, addresses a broad range of topics and themes of interest to all who are involved with undergraduate mathematics. These notes are to be readable, informative, and useful. The series will help the mathematical community keep up with developments of importance to mathematics.

Volumes in the MAA Notes Series include:

- Proceedings of conferences [e.g., TOWARD A LEAN AND LIVELY CALCULUS (vol. 6), and CALCULUS FOR A NEW CENTURY: A Pump Not a Filter (vol.8)]

- Collections of experiences and resources [e.g., COMPUTERS AND MATHEMATICS: The Use of Computers in Undergraduate Mathematics (vol. 9), and AMERICAN PERSPECTIVES ON THE FIFTH INTERNATIONAL CONGRESS ON MATHEMATICS EDUCATION (vol. 5)]
- Surveys of significant trends and developments [e.g., UNDERGRADUATE MATHEMATICAL SCIENCES IN UNIVERSITIES, FOUR-YEAR COLLEGES, AND TWO-YEAR COLLEGES: 1985–1986 (vol.7)]
- Reports and Recommendations [e.g., RECOMMENDATIONS ON THE MATHEMATICAL PREPARATION OF TEACHERS (vol. 2), and PROBLEM SOLVING IN THE MATHEMATICS CURRICULUM (vol.1)]
- Expositions of current mathematical interest for instructors and for classroom enrichment [e.g., NOTES ON PRIMALITY TESTING AND FACTORING (vol. 4)]

Working titles, with their proposers, of MAA Notes volumes presently under consideration include:

THE EUGENE STRENS MEMORIAL CONFERENCE ON RECREATIONAL MATHEMATICS AND ITS HISTORY, Richard K. Guy

GRAPHICS CALCULATORS IN UNDERGRADUATE MATHEMATICS, Franklin Demana, Gregory Foley, and Bert K. Waits  
PROBLEMS WORKBOOK USING COMPUTER ALGEBRA SYSTEMS, Stan Devitt  
TEACHING CALCULUS WITH AN HP-28S, John Kenelly  
LABORATORY PROJECTS FOR FIRST YEAR CALCULUS, Carl Leinbach

MATHEMATICAL WRITING, Donald Knuth  
WRITING ACROSS THE CURRICULUM, Andrew Sterrett

CALCULATOR-BASED PLACEMENT TESTING, and COMPUTER-GENERATED TESTS, and A PRACTICAL GUIDE TO PLACEMENT TESTING, Linda Boyd of the Committee on Placement Examinations (COPE)  
MATCHING HIGH SCHOOL PREPARATION WITH COLLEGE EXPECTATIONS: Prognostic and Diagnostic Testing, John Harvey (COPE)

INTRODUCTION TO COMPUTER GRAPHICS, Joan Wyzkoski  
VISUALIZATION IN MATHEMATICS, Walter Zimmerman

COMPUTERS IN GEOMETRY, James King  
FRACTALS AND THE COMPUTER, W.D. Withers

HISTORY OF MATHEMATICS: Topics for Classroom Use, V. Frederick Rickey

HUMANISTIC MATHEMATICS, Alvin White

MODELS FOR UNDERGRADUATE RESEARCH IN MATHEMATICS, Lester Senechal

ACTUARIAL MATHEMATICS, Ellen Torrence

These examples suggest the range of Notes volumes presently under consideration. I urge more of my colleagues to become involved with the development of this series. The individuals above are at work on these projects now and they welcome your interest, potential contributions, or suggestions with the exceptions of Knuth and Senechal who have already complete manuscripts.

As editor of the MAA Notes Series, I would like your comments on existing volumes and your suggestions for new topics and those who could put such new volumes together. Members of the MAA

Notes Editorial Board are: Donald W. Bushaw, Paul Campbell, Richard K. Guy, Frederick Hoffman, and David A. Smith. They also welcome your comments, suggestions, and ideas.

I hope you will send me, and encourage your colleagues to send me, your suggestions and proposals for future MAA Notes volumes. These should go to me at New York City Technical College, CUNY, 300 Jay Street, Brooklyn, New York 11201.



Washington is well known for its traffic congestion both in the city and around the beltway. But there is just a little more of it right now because it's moving time. As the occupant of the White House changes, many people are loading the moving van and are heading out of town. The recent election gives the new president the opportunity to fill not only the 13 cabinet posts (yes, we now have a baker's dozen of them since the Department of Veterans Affairs was added by the 100th Congress), but also several hundred "plum" jobs at the sub-cabinet level, typically deputy secretaries, undersecretaries, and assistant secretaries, as well as the heads of agencies such as the Office of Management and Budget, Social Security Administration, Food and Drug Administration, and so forth. A clever Washington insider decided to help the process along by publishing right at transition time a "prune" book (in hard-cover, no less) which lists the qualifications and responsibilities for over 300 senior level positions which the President-Elect must fill by the time he assumes the office. For the Office of Governmental and Public Affairs, your observation post in Washington, this is a time to give close attention to those who will be at the policy levers that affect the health of the mathematics enterprise in the coming four years.

The situation is a bit different on Capitol Hill, where over 99% of the House members returned to their former seats. There will be more changes on the Senate side, largely due to voluntary retirements, Senator Proxmire probably being the best known to scientists among those. Proxmire assumed the seat of the late Joe McCarthy, Senator from Wisconsin, in 1957 and has served without interruption since then. While most remembered for his monthly Golden Fleece Award, Proxmire had direct influence over the NSF budget as chairman of the appropriations subcommittee with jurisdiction over NSF and NASA. By coincidence, the corresponding subcommittee on the House side will also lose its chairman, the retiring Edward P. Boland (D-Ma). The new chairs of the Appropriations Subcommittees for HUD-Independent Agencies in the Senate and the House of Representatives will be Sen. Barbara Mikulski (D-Md) and Rep. Bob Traxler (D-Mi), respectively.

On the House side, the Science, Technology and Space Committee is losing two of its Republican members: Judd Gregg, who was elected Governor of New Hampshire, and Manuel Luhan from New Mexico, who chose not to run again.

Conventional wisdom ("inside the beltway") predicts some clashes between the White House and the Congress. There are numerous issues that require the early attention by the new President, in addition to filling his cabinet and senior appointments promptly.

A decision on many of these issues will affect the mathematics community directly.

The science advisory functions in the White House are likely to change in the new administration. According to statements made by Mr. Bush during the campaign, we are likely to see the President's science adviser to be elevated to presidential assistant who would sit on the White House Economics Council. We can also expect the present White House Science Council to be elevated from its present status to play a more significant role in technical decisions in the White House than before. This column is being written in early December and, of course, some of these early predictions may change by the time of the inauguration on January 20.

**THE FEDERAL BUDGET** Congress will have to deal with a potential \$30 billion cut to meet the Gramm-Rudman-Hollings target of limiting the budget deficit to \$100 billion. Unfortunately, a large part of the budget is off-limits, either because we deal with entitlement programs that are legally protected, or with priority programs where there is agreement between the Congress and the President. The non-defense part of the budget that is discretionary, i.e., subject to cutting, is 190 billion dollars in 1989. Twenty-five percent of that part goes into civilian and military R&D funding, which thus looms large on the list of candidates to be hit. A 16% cut across the board in the discretionary budget will produce the necessary \$30 billion to meet the Gramm-Rudman-Hollings-targets. That is before the Congress puts its protective mantle over any of its favorite projects.

New initiatives will push against that ceiling as well. Top candidates are: bailing out sick savings and loan institutions (estimated at \$50-100 billion), the President's commitment to better education, higher interest payments on the national debt, increases in defense spending, construction of roads and bridges and other infrastructure support.

There is an other mine floating in the troubled waters of the federal budget. The White House and the Congress have said very little about the continued raid on the social security trust fund. To reduce the deficit, the federal government has borrowed from the fund's current surplus monies which of course will have to be paid back later on. Without that help, the annual deficit would be \$220 billion by 1993! (Little wonder, when serious economists doubt that a flexible freeze will be the cure-all for our budget problems.)

The Council on Competitiveness, a high-level committee of business and labor leaders chaired by Hewlett-Packard chairman John A. Young, urged the President-Elect in late November to consider tight controls on federal spending and to consider seriously raising taxes in order to bring the federal budget into balance by the mid-1990's. That report includes among its signatories Paul E. Gray, President of M.I.T., Howard D. Samuel, AFL-CIO, and top executives from I.B.M., Ford Motor Co., Eastman-Kodak Co., TRW Inc., and Wells Fargo & Co., among others.

During the fall, the Roosevelt Institute ran 13 day-long "Citizen Assemblies" that included teachers, farmers, homemakers, retirees and clerks. Their grass-roots recommendations are found in a report "A Citizen's Agenda for the President". Their highest priorities: (1) Balance the budget, (2) Education, (3) Energy and the environment, (4) Defense, (5) Drugs and Crime, (6) U.S. role in the world (reduce it, they say), (7) Trade deficit, (8) Poverty, (8) Health/AIDS, and more categories, none of which received more than 10% approval of those questioned.

**BIG SCIENCE VS. LITTLE SCIENCE** To give you an idea of the competition that can be expected for the federal research dollar, here are some of the big projects that are being discussed right (*Washington Outlook continued on page 8*)

*(Washington Outlook continued from page 7)*

now in Washington. In November, the Department of Energy announced the site for the superconducting supercollider (SSC) to be in Texas. If that machine, which will ultimately cost an estimated \$4.5-6 billion, were not bought, that money would permit 300 mathematics departments in the country to acquire a \$20 million CRAY - Y/MP supercomputer, and help with the education of the next generation of students on state-of-the-art equipment. No doubt, other people have their own ideas how such a sum might be spent!

The Department of Energy was given responsibility for human genome project, that will cost at least as much as the SSC when it comes off. This project aims to map the DNA sequence of the human chromosome. Microbiologists are making a strong case as to the significance of this research for the understanding of genetic diseases and possible avenues to entirely different therapies.

The Congress has its own ideas about what is important and we can expect them to argue over the proposed site for the SSC, what needs to be done with the environment, how to combat AIDS, whether to fund the Space Station for NASA, whether to install an anti-fraud office in the Department of Health, Education and Welfare, in order to deal with the perceived laxity of the peer-review system in the medical and social sciences. This particular issue has not touched the mathematical community so far, but there is reason to be watchful when Congress starts hearings on this. What triggered the Congressional watchdogs' interest is an isolated case involving a Nobel Laureate in biology. But we may have to be concerned that legislation may address the peer-review system much more generally than what this particular case suggests. We shall keep an eye on any developments in this area.

**EDUCATION** During the fall campaign, Mr. Bush said he wants to be our Education President. Congress is quite serious about education. With Project MS 2000 the National Academy of Sciences is in the midst of a multi-year study to improve math education and expects to publish EVERYBODY COUNTS as a report to the nation in January, with more to follow through 1990. Math education, at all levels of government, currently costs the US about \$25 billion a year. (About \$22 billion goes into elementary and secondary education, \$3 billion into University undergraduate education, and about \$750 million goes into research, 80% of which is paid by Universities). We could practically double the federal math research budget of \$80 million, if we could just make a case for 1/3 of one per cent of that education budget! Should we not consider seriously what contribution the research community could make to the improvement of our educational system?

As the 101st Congress gets organized, the Office of Governmental and Public Affairs will communicate to you a list of those members of Congress (together with their districts), who will sit on the committees that will affect the future of our discipline. It might not be a bad idea for individual members of our societies to get to know the Senators and Representatives personally who control the purse strings. They do listen to their constituents. The competition for federal R&D money will be fierce, it is up to us to fight for our share!

*The Washington Outlook column this month was written by Hans J. Oser, most recently Technical Director at SIAM, formerly at the National Bureau of Standards, and now senior associate at the Office of Governmental and Public Affairs for the Joint Policy Board for Mathematics.*

## In Memoriam

**Sholom Artz**, Professor, Cooper Union, died 2 January 1988 at the age of 59. He was an MAA member for 38 years.

**Walter Leighton**, Professor Emeritus, University of Missouri-Columbia, died 27 August 1988 at the age of 80. He was an MAA member for 43 years.

**John F. Randolph**, Professor, Rochester Institute of Technology, died June 1988 at the age of 84. He was an MAA member for 61 years.

**Erich H. Rothe**, Professor Emeritus, University of Michigan, died 19 February 1988 at the age of 92. He was an MAA member for 44 years.

**Lucie C. Ruzicka**, Instructor, University of South Carolina, died 25 June 1988 at the age of 69. She was an MAA member for 2 years.

**Morris Schreiber**, Professor, Rockefeller University, died 30 April, 1988 at the age of 61. He was an MAA member for 2 years.

**Verne Schwab**, Physicist, The Johns Hopkins University, died 18 April 1988 at the age of 67. He was an MAA member for 2 years.

**Nathan Schwid**, Professor Emeritus, University of Wyoming, died 1 August 1987. He was an MAA member for 48 years.

**Robert D. Slauch**, Professor, State University of New York at Cortland, died March 1988 at the age of 71. He was an MAA member for 25 years.

**Rothwell Stephens**, Professor, Knox College, died 16 August 1988 at the age of 81. He was an MAA member for 57 years.

**Lewis E. Ward**, Professor, Harvard University, died 6 August 1988 at the age of 91. He was an MAA member for 71 years.

**Ralph M. Warten**, Professor, California Polytechnic Institute, died 20 April 1988 at the age of 62. He was an MAA member for 33 years.

Word has also been received on the deaths of the following MAA members:

**James A. Adkins**, Associate Professor Emeritus, Hamilton College; **Clyde R. Barrow**, Professor, Westminster College; **Robert O. Coffin**, student, Fayetteville State University; **Hartley B. Eckerson**; **Manon Friel**, retired; **Dennis Hamlin**, Teaching Assistant, University of Minnesota; **Marjorie L. Hoffman**, retired; **Robert Kalin**, Professor, Florida State University; **Julia P. Kennedy**, Assistant Professor, Georgia State University; **W.I. Keller**, Professor Emeritus, Bucknell University; **Dora McFarland**, Professor Emeritus, University of Oklahoma; **C. A. Murray**, retired; **Clarence E. Olander**, Senior Vice-President and Editor in Chief, School Division, Scott Foresman and Company; **Michael F. Pheilan**, Instructor, Community College of Allegheny City; **Joel A. Polak**, AT&T Bell Laboratories; **William H. Sammons**, retired; **Murray S. Watkins**, Computer Systems Analyst; **Max S. Weinstein**, retired; **Arthur D. Wirshup**, Professor Emeritus, California Polytechnic State University.





An illustrated problem from the 1986 USAMO. The problem has been reworded to match the illustration.

During George Berzsenyi's lecture on Ceva's Theorem, each of the five mathematicians fell asleep exactly twice. For each pair of mathematicians, there was some moment when both were sleeping simultaneously.

Prove that, at some moment, some three of them were sleeping simultaneously.

The audience shown here, from left to right, includes Dorothy Faye Thames, Michael A. Laidacker, Sam M. Wood, Jr., Jeremiah M. Stark, and Elizabeth Castle; the photo was taken at Lamar University.

## Happy 40th Birthday, AHSME!

Leo J. Schneider and Walter E. Mientka

The 40th annual American High School Mathematics Examination (AHSME) will be held on February 28, 1989. With roots as a section activity in 1950, it has become a major MAA project with an annual participation of almost 400,000 students in over 6,000 high schools in the U.S., Canada, and abroad. Its purpose is to identify and encourage, through friendly competition, secondary students with an interest in and talent for mathematical problem solving. We wish it well as it approaches middle age!

**HISTORY** At a meeting of officers of the MAA in August 1955, Professor W.H. Fagerstrom, then chair of the Contest Committee of the Metropolitan New York Section, suggested that, since the Annual High School Mathematics Examination (now called the American High School Mathematics Examination), initiated in 1950 by the Metropolitan New York Section had, in effect, become national in scope, it would be appropriate for the parent association, the MAA, to sponsor it. Starting with a small number of New York high schools, by 1955 it had grown to 23,000 participants in 881 high schools, representing nearly every part of the United States and Canada.

At about the same time, the Society of Actuaries designated a committee to study means to counteract the decreasing number of college graduates seeking careers in mathematical fields. When it was determined that the long-term answer to the problem was stimulation of interest in mathematics at the high school level, contact among committee members of both organizations developed. Thereupon, the Society of Actuaries joined with the MAA to provide the additional financial support needed to organize and promote the competition effectively on a full-scale international basis.

Additional sponsors are Mu Alpha Theta (1965), The National Council of Teachers of Mathematics (1968), the Casualty Actuarial Society (1971), the American Statistical Association (1985), the American Mathematical Association of Two-year Colleges (1985), and the American Mathematical Society (1987).

**RELATED EXAMS** When the MAA initiated the United State Mathematical Olympiad (USAMO) in 1972 to select students to represent the U.S. in the International Mathematical Olympiad, the highly successful AHSME was in its 22nd year and the ideal qualifier for the USAMO. In 1983 the MAA started the American Invi-

tational Mathematics Examination (AIME) to give more of the top AHSME students a challenging sequel. In 1985, when the MAA felt pre-high school students should be exposed to more stimulating mathematics, the 35-year-old AHSME was used as a model for the American Junior High Mathematics Examination (AJHSME).

Thus the AHSME, whose 40th birthday we celebrate in 1988, is not only a tremendous successful mathematics contests.

**ADMINISTRATION** The MAA Committee on the American Mathematics Competitions (CAMC) administers the AJHSME, AHSME, AIME, and USAMO.

There is a subcommittee to write each of the four examination. These subcommittees include junior and senior high school teachers, insurance executives, statisticians, and university and college faculty. The subcommittee members are appointed by the president of The MAA.

The CAMC consists of representatives of the eight sponsoring organizations, the chairs of the subcommittees for the four examinations, and a chair and an executive director who are appointed by the president of The MAA. The CAMC sets the policy for and supervises the work of the four examination subcommittees. Currently, the chair of the CAMC also serves as chair of the AHSME subcommittee.

An advisory panel, appointed by the chair of the CAMC, assists the subcommittees in fulfilling their responsibilities of creating and critiquing problems and reviewing drafts of problems and solutions. Appointees to the examination subcommittees are chosen from the panel. All eight sponsoring organizations recommend persons to the panel. Frequent turnover of personnel on the panel and subcommittees keeps a 40-year-old AHSME young and fresh.

**CONTENT** The AHSME is a 30-question multiple choice examination on secondary school mathematics excluding calculus. The problems range from easy to those which will challenge the best mathematics students in the country. In 39 years, of the approximately 10 million students who have participated, only 28 have written perfect papers. Try a few questions from recent examinations. Remember that no calculators are permitted!

Which of the following is closest to  $\sqrt{65} - \sqrt{63}$  ?  
 (A) .12 (B) .13 (C) .14 (D) .15 (E) .16  
*(AHSME Anniversary continued on page 10)*

(AHSME Anniversary continued from page 9)

A ball was floating in a lake when the lake froze. The ball was removed (without breaking the ice), leaving a hole 24 cm across at the top and 8 cm deep. What was the radius of the ball (in centimeters)?

- (A) 8 (B) 12 (C) 13 (D)  $8\sqrt{3}$  (E)  $6\sqrt{6}$

Each integer 1 through 9 is written on a separate slip of paper and all nine slips are put into a hat. Jack picks one of these slips at random and puts it back. Then Jill picks a slip at random. Which digit is most likely to be the units digit of the sum of Jack's integer and Jill's integer?

- (A) 0 (B) 1 (C) 8 (D) 9 (E) Each is equally likely.

If  $\sin(x) = 3 \cos(x)$  then what is  $\sin(x) \cos(x)$ ?

- (A)  $\frac{1}{6}$  (B)  $\frac{1}{5}$  (C)  $\frac{2}{9}$  (D)  $\frac{1}{4}$  (E)  $\frac{3}{10}$

Suppose that  $p$  and  $q$  are positive numbers for which

$$\log_9(p) = \log_{12}(q) = \log_{16}(p + q)$$

What is the value of  $\frac{q}{p}$ ?

- (A)  $\frac{4}{3}$  (B)  $\frac{1}{2}(1 + \sqrt{3})$  (C)  $\frac{8}{5}$  (D)  $\frac{1}{2}(1 + \sqrt{5})$  (E)  $\frac{16}{9}$

Check your answers against those at the bottom of the first column on page 12.

All the problems (with solutions) from the first 39 years of the AHSME are in the New Mathematics Library. Volumes 5, 17, 25, 29 cover 1950-82. The problems from the 1983-88 AHSME and AIME are in a new volume to appear this year.

**MORE INFORMATION** For information about registering for the AHSME or AHJSME or about purchase of sample AHJSME, AHSME, or USAMO test booklets, contact the Executive Director for our CAMC activities: Professor Walter Mientka, University of Nebraska, Lincoln, Nebraska 68588. For information about joining the problem-writing activities for these examinations, contact the chair of the AHSME and CAMC committees: Professor Leo Schneider, John Carroll University, University Heights, OH 44118.



#### MAA CERTIFICATE OF MERIT

Walter E. Mientka (left),  
Director,  
American Mathematics Competition

The Certificate of Merit is a special award for special people. There is no committee assigned to seek out worthy candidates. The award is pre-

sented from time to time by the top officers of the MAA to individuals who have made exceptional contributions to the goals of the association. Walter Mientka is certainly worthy of this special recognition. His enthusiasm, leadership, and work for high school mathematics competitions make him a unique maximal element among all who are involved in MAA projects.

Walter Mientka's work for the American Mathematics Competitions is built upon and runs parallel to his professorial duties, which he performs with equal distinction. He received the University of Ne-

braska Distinguished Teaching Award, was responsible for obtaining NSF grants totaling over a million dollars, served as Associate Chair of his department, directs doctoral theses in number theory, and gives many talks each year covering a spectrum from presentations at research conferences to talks at small, rural Nebraska high schools.

Walter Mientka was appointed Executive Director of the American Mathematics Competitions in 1976. Since then, about five million high school students have taken the American High School Mathematics Examination. Relatively few mathematicians can boast that more than five million have read and agonized over mathematics printed above their names. For this exam Walter works to increase participation with about 70 Regional Examination Coordinators distributed throughout this country and Canada and at key spots throughout the world. Consequently, it should not take another 13 years for Walter to double his five million figure on that exam.

Another of the four tests in his care is the American Junior High School Mathematics Examination for seventh and eighth graders, which just completed its third year. It has already had over 600,000 participants. Unlike the 40-year-old senior high school examination, the junior high school exam is completely packaged, distributed, and computer graded right at Walter's office. For this exam, Walter serves as his own Nebraska volunteer. Consequently, that state is always one of the top ten in national participation.

Walter has had outstanding success in finding and organizing volunteers to promote our examinations. There are now over 100 such volunteers who augment Walter's office staff of three full-time and two part-time people, plus work-study students. His wife, Gretel, office manager, creates order from potential chaos. Our four high school examinations do not come from a faceless, faraway institution. They are born in, and nurtured by, a Nebraska family named Mientka.

*This story is based on the citation read by Leo Schneider at the August 9, 1988 national meeting of The Mathematical Association of America when Professor Mientka received the MAA Certificate of Merit.*

## AMP: One Year Old and Growing Fast

Alfred B. Willcox, Executive Director, MAA

How can a research mathematician contribute to better mathematics teaching in her local high schools? How can a high school mathematics teacher share his best ideas with other teachers and establish collegial relationships with other mathematics professionals in the community? How can mathematicians in business or industry help bring the experience of mathematics at work into the classroom? How can a mathematics supervisor shed her administrative cloak and reach out as a colleague to a teacher whose confidence and sense of professional worth are in need of a boost?

They should all join a local Mathematics Teacher Project (MTP)—or help form one if none exists. And AMP, the American Mathematics Project, is the national program set up to encourage formation of local MTP's.

What are these MTP's that they can serve such diverse purposes? An MTP is a local enterprise—locally planned, operated, and funded—which brings together university mathematicians, school mathematics teachers, professionals in business and industry, and



Ivan Niven, AMP-LINE coeditor, and Phil Daro, AMP Executive Director, at the wrap-up of the successful conference at Airlie House.

school administrators in a joint effort to improve the teaching of mathematics. Several dozen MTP's are in successful operation across the nation, making important contributions to teachers' enthusiasm, knowledge, and sense of professional worth, and improving the mathematics education in their communities.

These MTP's are arguably the most efficient way for the mathematical community to make quick improvements in the quality of pre-college mathematics education. Those who participate note that the benefits flow in *all* directions. But, the number of these projects is small in relation to the need and opportunity. Twice as many MTP's could do twice as much; ten times could increase the benefit an order of magnitude. The seeds are there; fertile ground abounds; where are the sowers and tillers?

The MAA and NCTM are planting the seeds and cultivating the soil. The mechanism is the American Mathematics Project. AMP is a project sponsored jointly by the MAA and NCTM and supported by grants to the MAA from NSF, the Ford Foundation, and the Carnegie Corporation of New York, designed to help 20 or more new MTP's take root across the nation.

After a year of organization and preparation, AMP seeded these projects during a national workshop, held at the Airlie Conference Center near Washington on October 21-23. Twenty teams of 3-6 persons from 20 local areas in 15 states were brought together for a weekend with 20 "mentors," key participants in successful existing MTP's, the "mentor projects."

The teams, chosen from applications submitted to an AMP selection committee in response to calls in FOCUS and NCTM's NEWS BULLETIN, consisted of individuals from a local area—a city, a school district, a cohesive geographical area, even a state—who are seriously interested in starting MTP's but need help in defining their goals, setting up their organization, and arranging their funding.

Prior to the AMP Workshop, the first issue of AMP LINE, a quarterly newsletter, had appeared, containing descriptions of AMP's goals and plans and information about the teams and some of the mentor projects.

During the Workshop, Paul Sally, founder and the first director of the Chicago Mathematics Project, and Leon Henkin, a founder of the Bay Area Mathematics Project and the recognized father of AMP used their own rich experience to inspire their listeners and provide them with a rich store of tricks of this particular trade.

R.O. Wells, AMP Project Director, Phil Daro, AMP Executive Director, and Elizabeth Stage, AMP Associate Director, each spoke

about the goals of AMP and the opportunities for service to mathematics education afforded by MTP's. The Ford Foundation's Barbara Nelson, a member of the AMP Steering Committee, spoke on how to make MTP ideas become realities.

Mentors and teams mixed and discussed ideas for two days, during which time lasting mentor-team relationships were formed and the teams were able to solidify their ideas and to make plans for action in the coming months.

The Workshop's 20 teams returned home fired with enthusiasm and armed with a basic tool kit to build their own local MTP's. AMP is not sitting back to await results. AMP will follow the local teams and their mentors closely for two years, providing more information, arranging for consulting visits by mentors to the teams' local bases and for summer internships by team members in mentor projects. AMP LINE will continually feed information and stimulation to the teams. We hope to organize a follow-up workshop in 12-18 months.

Two years from now, AMP hopes to view with parental pride close to 20 new local Mathematics Teacher Projects. Then it will be time to turn these projects into mentors for another cycle. There is no reason for AMP to have a finite life span. Teachers need networks, and teacher networks need a network. AMP plans to be that network for mathematics. For more information about AMP, AMP LINE, and ideas on starting an MTP in your community, write to Phil Daro, AMP, Executive Director, American Mathematics Project, 317 University Hall, University of California at Berkeley, Berkeley, CA 94720.

## The Edyth May Sliffe Awards for Distinguished High School Mathematics Teaching

Walter E. Mientka



Edyth May Sliffe  
1901-1986

Many talented and dedicated mathematics teachers are responsible for their school's consistently high scores on mathematics competitions. Such teachers must wonder why all the awards and recognition go to the team

and none to the teachers. One such teacher was Miss Edyth May Sliffe who taught at Emery High School in Emeryville, California until her retirement in 1962. She decided to do something about this inequity.

In 1978 Edyth contacted Professor Kenneth Rebman, Governor of the Northern California Section of the MAA at the time, expressing interest in making a bequest to the MAA to give awards to high school mathematics teachers whose teams do well on the American High School Mathematics Examination (AHSME). Her students had always done well on that examination and had received various honors, but she had never received any recognition. She believed that such teachers should also receive recognition and (*Edyth May Sliffe Awards continued on page 12*)

*(Edyth May Sliffe Awards continued from page 11)*

awards. Professor Rebman contacted Professor Henry Alder, then MAA President, and suggested that he contact Edyth. After a meeting with Professor Alder, Edyth arranged that, aside from small bequests to two cousins, her estate would go to the MAA to be used to recognize, annually, twenty mathematics teachers who were responsible for the success for the highest scoring school teams on the AHSME.

I was informed of the will by Henry Alder and David Roselle (then Secretary of the MAA), and thus began a nine year association with Edyth. I found her to be an extremely bright, thoughtful, and sensitive person. Her students considered her to be a "hard" teacher. (She required them to write "neat" solutions to the homework problems in notebooks which she graded critically every night.) I attended an Emery High School multiple class reunion with her and saw a continuous procession of former students thanking her for the education and discipline she gave them. I was regularly in touch with her either by telephone or in person until her death on December 11, 1986.

Edyth was born in Fox Valley, Oregon on May 4, 1901 and grew up in John Day, a small lumber town in eastern Oregon nestled at the foot of Strawberry Mountain. Her father, who delivered supplies with a two horse wagon to the lumber camps, taught her the fundamentals of investment. This ultimately led to a significant stock portfolio. Following her graduation from the University of Oregon with a music major, she moved to California where she enrolled in several courses in mathematics at the University of California at Berkeley. She then began her teaching career at Emery High School where she taught for thirty-six years. Her principal interests during her retirement years were in her investments and ballroom dancing.

The assets of Edyth's estate were distributed in accordance with her will. The amount that went to the MAA was in excess of a quarter million dollars. In February 1988, President Gillman appointed the Edyth May Sliffe Awards Committee to decide on those mechanisms not specified in the will for making the awards. Her bequest will be used to provide monetary awards ranging from one hundred to five hundred dollars, a letter of recognition from the President of the MAA and Chair of the Committee on the AHSME, a free one-year membership in the MAA, and suitable recognition in national and regional professional publications.

The "Edyth May Sliffe Awards for Distinguished High School Mathematics Teaching" will recognize the excellence of teachers responsible for the success for the highest scoring teams on the AHSME. Beginning with the 1989 AHSME and thereafter, approximately twenty teachers will receive this honor, selected from the top forty United States and Canadian schools on the basis of nominations received from students at these schools.

I am grateful for the opportunity to have known Edyth. She has provided the MAA with the opportunity to recognize teachers whose dedication to developing their gifted students' mathematical talent is outstanding. Each year over 6,000 teachers assist with the implementation of the AHSME, and it is gratifying to know that, beginning with the 1989 AHSME, twenty of them will be recognized as EDYTH MAY SLIFFE AWARD recipients.

*Walter E. Mientka serves as Executive Director of the MAA's American Mathematics Competitions. These competitions are cosponsored by the following seven organizations: The Society of Actuaries, Mu Alpha Theta, The NCTM, The Casualty Actuarial Society, The American Statistical Association, AMATYC, and The AMS.*

Answers to problems on pages 9 and 10: B, C, A, E, D

*(Calendar continued from back cover)*

**March 31–April 1** Spring Conference on the First Two Years: Teaching the Mathematical Core, University of Hartford. Topics: discrete mathematics, calculus revision, and curriculum development. Featured speakers include: Ron Douglas, Jan DeLange, John Kenelly, and Fred Roberts. Persons interested in giving a short talk or demonstration on classroom experience with calculus revision, innovative teaching techniques, modeling in freshman and sophomore classes, or development of courses in discrete mathematics should submit an abstract to: Conference Committee, Math/Physics/Computer Science Department, University of Hartford, 200 Bloomfield Avenue, West Hartford, Connecticut 06117. This conference is funded by the Exxon Education Foundation.

**April 6–8** Twenty-Seventh Biennial Kappa Mu Epsilon National Convention, Washburn University, Topeka, Kansas 66621. For further information, contact James Smith, Muskingum College, New Concord, Ohio 43762; (614) 826-8306; or Harold Thomas, Pittsburgh State University, Pittsburgh, Kansas 66762; (316) 231-7000, ext. 4409.

**April 9–11** Twelfth Annual Symposium on Developmental and Remedial Education, sponsored by the New York College Learning Skills Association, Albany, New York. Dr. Judith Langer of SUNY Albany will give the keynote address. Other speakers include Dr. Robert Hackworth on mathematics. For information, contact: David Martin, Director, Learning Skills Center, Cayuga Community College, Auburn, New York 13021; (315) 255-1743, ext. 304.

**April 12–15** 67th Annual Meeting of the National Council of Teachers of Mathematics, Orlando, Florida. For information, contact Betty C. Richardson, Director of Convention Services, NCTM, 1906 Association Drive, Reston, Virginia 22091; (703) 620-9840.

**April 14–16** Annual New York State Mathematics Association of Two-Year Colleges Conference, Albany Hilton, Albany, New York. For information, contact Ernest Danforth, Mathematics Department, Corning, New York 14830; (607)962-9243.

**May 4–7** Second Workshop of the Mathematicians and Education Reform Network at the University of California, Berkeley. Philip D. Wagreich of the University of Illinois, Chicago and Harvey B. Keynes of the University of Minnesota direct the MER Network. It aims to strengthen ties among mathematicians involved in precollege educational activities and to encourage more mathematicians to become involved in such activities. The workshop will feature presentations by mathematicians who direct "exemplary projects" at the elementary or high school level, and panel discussions on topics including underrepresented groups in mathematics programs. Grant funds will cover accommodations, meals, and materials for 30 participants; a small number of travel grants will be available. For further information, contact: Naomi Fisher, Associate Director, MER Network, University of Illinois at Chicago, Office of Mathematics and Computer Education (M/C 249) Box 4348, Chicago, Illinois 60680; (312) 996-2439.

**June 5–9** Chaos and the Microcomputer, a workshop sponsored by the Maryland-Virginia-District of Columbia Section. See MAA Workshops on page 6 of this issue of FOCUS.

**June 12–16** Decision Making and the Microcomputer, a workshop sponsored by the Maryland-Virginia-District of Columbia Section. See MAA Workshops on page 6 of this issue of FOCUS.

**June 15–18** Third Boston Workshop, Wellesley College, Wellesley, Massachusetts. To support undergraduate teaching; emphasis on renewal of calculus, applied linear algebra and differential equations, and algorithms. For further information, contact: Gilbert Strang, Room 2-240, MIT, Cambridge, Massachusetts; (617) 253-4383.

**June 19–23** Workshop in Mathematical Modeling sponsored by the Allegheny Mountain Section. See MAA Workshops on page 6 of this issue of FOCUS.

# FOCUS on MAA Committees

## New FOCUS Column on Committees Launched

The work of the Association is carried on by its committees and in its sections. MAA committees range from long-standing, large and complex enterprises such as the Committee on the Undergraduate Program in Mathematics (CUPM), the Committee on Publications, and the Committee on the American Mathematics Competitions to small special purpose committees such as that recently convened to make arrangements for the new Edyth May Sliffe Awards (see page 11). Joint committees or task forces allow the MAA to join with other organizations to deal with larger issues such as the curriculum in grades 11–13 (see Donovan Lichtenberg's article in the December 1988 FOCUS), the American Mathematics Project (see page 10), and the report here on the Task Force on Minorities in Mathematics.

FOCUS is starting a new column under the heading COMMITTEE NEWS to be written by Dr. Susan L. Forman of Bronx Community College—CUNY. This will gather the latest news, requests for information, or other assistance from all MAA committees. Committees Please Route Your News and Requests For This Column To: Dr. Susan L. Forman, 110 Bank Street, Apartment 4D, New York, New York 10014.

## Bringing Minorities Fully Into Mathematics: MAA Task Force Recommends Action

In February of 1987 the MAA established its Task Force on Minorities in Mathematics. After 18 months of work by the 42 people of the Task Force and its four operating committees, the Task Force, Chaired by Louise Raphael of Howard University, has delivered a solid report that shows the degree to which the mathematical sciences have failed to recruit minorities, exposes some of the causes of this failure, and proposes many ways to improve the situation. The Task Force included strong representation from the black, Hispanic, and Native American mathematical communities along with those with currently successful intervention programs reaching out to minorities. The issues here are very broad and include not only education but also the status of minority professionals now working in the mathematical sciences.

The specifics for possible MAA action are given in the report's 42 recommendations,

and broader suggestions and much background material are found in the 43 pages of the report proper and its more than 200 pages of appendices. The report represents a fine effort by the Task Force's volunteers with the support of the MAA and its headquarters staff and a \$15,000 grant from The Ford Foundation that granted cover costs of a working retreat during which the final report was hammered into shape.

The first order of business is to establish a standing Committee on Minority Participation in Mathematics, a motion on the MAA Board of Governors' January agenda. This standing committee will draw upon the work of the Task Force to develop and help carry out a national program. The proposal for this potential new committee includes the following suggestions for the committee's charge:

- Prepare for approval by the MAA Board of Governors a major policy statement which outlines the current situation with respect to mathematics education and minorities from kindergarten through graduate school and which states the need for increasing the number of minorities in mathematics as a top priority of the Association.
- Put in priority order and set a time-table for the 42 specific recommendations of the Task Force.
- Prepare for approval by the MAA Board of Governors a national program aimed at improving mathematics education for minorities.
- Begin the search for outside funding to support the establishment of an Office of Minority Participation in Mathematics, and to define its responsibilities.
- Investigate the possibilities for collaborative efforts with other private and public agencies which share the mutual interest of improving mathematics education for minorities.

Louise Raphael was surprised that "the mathematical community is unaware of both the depth of the problem and the demographics." These demographics, quoted in the Task Force report, show that we are all dependent on the success of minorities. Here they are in brief:

- In 1950, 17 workers were paying into the social security system for each retiree drawing from it. By 1992 the ratio will be three workers (one a minority worker) for every retiree drawing benefits.
- By the year 2000 one in every three people in the USA will be a black or Hispanic.
- By the year 2000 80% of those entering the work force will be minorities, women, or new immigrants.
- By the year 2000 42% of those in the K–12 grade school age population will be minorities.

If we are all in the same boat, how are we doing? These words from Task Force Chair

Louise Raphael's statement to the MAA Board of Governors give the answer:

"Headlines in several newspapers since the Task Force's establishment point to the many issues of mathematics education for minorities.

'College Outlook Grim for Blacks 25 Years After Barriers Fell,' 'Panel Urges Colleges to Boost Production of Minority Scientists,' 'Neglect of Minorities Jeopardizes Future U.S. Prosperity,' 'Many Minority Teachers Plan to Quit.'

"All of these in their own way call for the recognition, nurturing, motivation, and development of minority intellectual talent to its fullest potential. The MAA must encourage its members to work with minority students with the same enthusiasm and dedication they use with students who are identified as gifted and talented."

**WHAT CAN BE DONE** The Task Force grouped its recommendations under three categories: internal MAA operations, collaborative endeavors, and innovative intervention programs. Under internal MAA operations the first priority was the establishment of the standing committee described above. Also among the 20 recommendations in this category are the revival of the MAA's Blacks and Mathematics program, a reaching out to minorities for roles in all MAA activities, and a reaching out to minority students in the various MAA competitions.

Under collaborative endeavors the Task Force recommends further efforts along the lines of AMP. This is a joint MAA–NCTM effort that is building local networks to improve mathematics education. The Task Force points to the existing AMS–MAA–AAAS Committee on Opportunities in Mathematics for Underrepresented Minorities. There are 11 specific recommendations under this heading. Many of these involve building local networks and creating new linkages with the NAM or the AM-ATYC so as to reach out more effectively to minorities.

Innovative intervention programs, the Task Force's third category, offers perhaps the greatest challenges and opportunities. On a modest scale, but with high probability of quick positive pay-off, Task Force recommendation 33 suggests that the MAA help create a network of undergraduate research programs aimed at preparing minority students for graduate study. This suggestion is close to the idea behind the PDP/Math Summer Program reported on pages 5 and 6 of this FOCUS. Many of the 11 recommendations under this heading were bold and imaginative, suggesting links be established with major employers or the various armed services to help minority students develop mathematical skills.

## FOCUS EMPLOYMENT ADVERTISEMENTS

FOCUS advertisements reach the MAA's 28,000 members, most of whom are college and university mathematicians. FOCUS now offers a new line of advertisement formats; for these new formats we have adjusted our rates per inch accordingly. FOCUS ads now cost approximately 60 cents per word for solid text; such text will yield roughly sixty-six words for each eight lines and slightly more than eight lines per inch.

Rates for FOCUS Employment Ads are:

- 50 words or less: \$37.50
- More than 50 words: \$40.00 per column inch

There is a 15% discount for the same ad in more than two consecutive issues (with contract in advance). An insertion order on institutional letterhead will be considered a contract. Charges will be billed after the first occurrence specified in the contract.

Anyone wishing to place an employment advertisement in FOCUS should write to: Siobhán B. Chamberlin, FOCUS Employment Advertisements, The Mathematical Association of America, 1529 Eighteenth Street, N.W., Washington, D.C. 20036. For more information, call the MAA Washington office at (202) 387-5200.

The deadline for submission in the May-June issue is April 2, 1989.

### OBERLIN COLLEGE

**Mathematics Department  
Oberlin, Ohio 44074**

Two-year visiting assistant professor position beginning in the fall 1989-90. Required: Ph.D. completed or expected by 9/89, strong interest in undergraduate teaching. Preferred specialties: statistics or operations research. Teach 5 courses per year. Rank: assistant professor or higher, salary commensurate with experience. Have resumé, transcripts, and three letters of reference sent to Robert M. Young, Chairman, Mathematics Department, Oberlin College, Oberlin, OH 44074 by February 17, 1989. Applications received after that date will be considered until the position is filled. Oberlin College is an Equal Opportunity/Affirmative Action Employer.

### MOREHEAD STATE UNIVERSITY

**Department of Mathematical Sciences  
Assistant Professor of Mathematics**

Morehead State University invites nominations and applications for a tenure track position of Assistant Professor of Mathematics beginning August, 1989. **Responsibilities:** Teach 12 hours per semester of primarily undergraduate courses together with committee work, advising, and service. **Qualifications:** Ph.D. preferred; minimum of Master's degree in mathematics/statistics plus additional course work required. A strong commitment to quality instruction is necessary. Preference given those with experience and/or training in statistics or computing. Submit letter of application, resumé, and references no later than February 15, 1989, to:

Office of Personnel Services  
Morehead State University  
RM101  
Morehead, KY 40351

MSU is an EEO/AA Employer and requires compliance with the Immigration Reform and Control Act of 1986.

### ASSISTANT PROFESSOR

The University of Connecticut's Mathematics Department invites applications for an anticipated full-time position at the Assistant Professor level at the Stamford Regional Campus. The Stamford Campus is located in an attractive, dynamic, growing area that several large corporations have chosen for their world headquarters. The Campus development plan calls for the institution of undergraduate major programs in mathematics, to which the holder of this position will contribute. A Ph.D. in Mathematics, some demonstrated talent in teaching undergraduates, and evidence of ability to contribute to the research mission of the department are required. (Candidates anticipating completion of the Ph.D. prior to September, 1989 will be considered.) Salary will be competitive, commensurate with qualifications. Screening will begin immediately and will continue until the position is filled. Please send curriculum vitae and at least three letters of reference to: Professor James F. Hurley, Association Head, Department of Mathematics, U-9, 196 Auditorium Road, Storrs, CT 06269-3009. The University of Connecticut is an Affirmative Action/Equal Opportunity Employer. (Search #9A97)

### ASSISTANT PROFESSOR

The University of Connecticut Mathematics Department invites applications for an anticipated full-time position at the Assistant Professor level at the University's Torrington branch. As a part of the Litchfield County Center for Higher Education, the campus is convenient to the Hartford metropolitan area in a region noted for its natural beauty. The Center's unique nature provides opportunities for a broad range of teaching, research, and service. A Ph.D. in Mathematics, some demonstrated talent in teaching undergraduates, and evidence of ability to contribute to the research mission of the department are required. (Candidates anticipating completion of the Ph.D. prior to September, 1989 will be considered.) Salary will be competitive, commensurate with qualifications. Screening will begin December 16, 1988, and will continue until the position is filled. Please send curriculum vitae and at least three letters of reference to: Professor James F. Hurley, Associate Head, Department of Mathematics, U-9, 196 Auditorium Road, Storrs, CT 06269-3009. The University of Connecticut is an Affirmative Action/Equal Opportunity Employer. (Search #9A102)

### BOWDOIN COLLEGE

**Brunswick, Maine 04011**

Two visiting positions, Mathematics Department, rank open, starting September, 1989. Two-year terminal positions. Ph.D. expected. Normal teaching load 6 hours per week. Candidates with record of effective undergraduate teaching preferred. Send resumé and 3 letters of recommendation to Wells Johnson, Chairman, Department of Mathematics, Bowdoin College, Brunswick, ME 04011. Application review begins April 1, 1989, but new applications will be accepted until the position is filled. Bowdoin College is committed to Equal Opportunity through Affirmative Action.

### UNIVERSITY OF MONTEVALLO

**Department of Mathematics and Physics**

A tenure-track assistant professorship is available beginning August 28, 1989. A Ph.D. in physics with college level teaching experience in mathematics or a Ph.D. in mathematics with a strong physics background is preferred. Salary is competitive and dependent on qualifications. Applications preferred by

January 30, 1989 but accepted until the position is filled. Send application, resumé, and three letters of recommendation to:

Dr. Angela Hernandez  
Department of Mathematics and Physics  
University of Montevallo  
Montevallo, AL 35115

UM is an Equal Opportunity/Affirmative Action Institution.

### MATHEMATICS

Indiana University of Pennsylvania invites applications for a permanent tenure-track position at the Assistant/Associate Professor rank in Mathematics Education, beginning September 1989. Duties are to teach 12 semester hours undergraduate/graduate courses per semester, to assist in curriculum and course revision, to advise students and serve on faculty committees, to participate in academic and professional activities of the department, and to engage in scholarly activities such as publication of work in professional journals, presentations at meetings of professional, and the writing of grant proposals. A Ph.D. or Ed.D. (awarded by June 30, 1989) in Mathematics Education is required, with emphasis on and/or experience in teaching mathematics at some K-8 grade level. Also required is evidence of effective teaching and research promise in Mathematics Education, and preparation and ability to teach basic college mathematics courses. Preferred but not required is experience in or evidence of research activity in Mathematics Education at the K-8 level; membership in recognized professional organizations; interest and/or experience in working with exceptional children; experience in directing a curriculum laboratory; and experience in working with teachers through inservice projects. Review of applications will begin on February 15, 1989 and will continue until the position is filled. Send letter of application, resumé, transcripts, and three letters of reference to Professor Joanne Mueller, Search Committee E, Department of Mathematics, Indiana University of Pennsylvania, Indiana, PA 15705. IUP is an Affirmative Action/Equal Opportunity Employer.

### ADAMS STATE COLLEGE

**Alamosa, Colorado**

Applications are invited for two tenure-track faculty positions in math/computer science. Starting Date August 25, 1989. Send letter of application, resumé, transcripts, three letters of reference, and citizenship status to: Math/Computer Science Search, c/o Dr. Kay Watkins, Adams State College, Alamosa, CO 81102, (719) 589-7256. Specify Search #1, #2, or both.

- 1) Teach intro and advanced courses in computer science. MA in computer science or math with formal coursework in computer science required.
- 2) Teach intro and advanced courses in math and computer science. MA in mathematics with formal coursework in computer science required. Broad background in mathematics preferred.

Complete applications will be considered beginning February 20, 1989. AA/EOE. ASC is particularly interested in applications from women and minorities.

### SAN JOSE STATE UNIVERSITY

**Department of Mathematics  
and Computer Science**

Three tenure-track faculty positions for Assistant or Associate Professor (Professor in exceptional case), Ph.D. in mathematical science; prefer expertise in partial differentials, numerical analysis, ap-

plied mathematics, mathematics education, statistics, or computer science. Candidates must have a commitment to quality teaching at all levels and interest in department affairs. Significant professional activity required for eventual consideration. Salary from \$28,000-55,400 per academic year. FPS 89-82, 83, 84.

Two tenure-track positions for Assistant or Associate Professor (professor in exceptional case), Ph.D. in computer science preferred, but a Ph.D. in any of the mathematical sciences, together with substantial teaching/research experience in computer science may also be acceptable. Candidates must have a commitment to quality teaching at all levels and interest in departmental affairs. Significant scholarly or professional activity is required for eventual tenure consideration. Salary from \$35,200-59,800 per academic year. FPS 89-80,81.

Application deadline February 3, 1989. Send vita, three letters of reference, and transcripts to: Dr. Veril L. Phillips, Chair, Department of Mathematics and Computer Science, San Jose State University, San Jose, CA 95192-0103. EEO/AA

### ASSISTANT PROFESSOR

#### Mathematics/Computer Science Department

Statistics, Glassboro State College (full-time tenure-track position). Teach statistics courses, particularly in the area of application. Ph.D. required. Evidence of excellent undergraduate teaching should also be available. BEGIN: 9/1/89. SALARY: Competitive. Send resumé by February 1, 1989, to: Dr. Janet Caldwell, Hiring Committee (Pool #2), Department of Mathematics and Computer Science, Glassboro State College, Glassboro, NJ 08028. Glassboro State college is a comprehensive institution with an enrollment of 8,000 undergraduate and 1,200 graduate students in four schools: Liberal Arts and Sciences; Business Administration; Education and Related Professional Studies; Fine and Performing Arts. It is located in southern New Jersey, 17 miles southeast of Philadelphia. It is an Affirmative Action/Equal Opportunity Employer. Applications from women, minorities, and the handicapped are encouraged.

### THE UNIVERSITY OF WISCONSIN-WHITEWATER

The University of Wisconsin-Whitewater announces three tenure-track teaching positions open August 1989. Ph.D. or ABD in mathematics or a mathematical science required. For two of these positions, experience in statistics or computer science is required. UW-Whitewater is located in SE Wisconsin near Madison, Milwaukee, and Chicago. For the complete position description contact: David Stoneman, Dept. of Math and CS, UW-Whitewater, Whitewater WI 53190. (414) 472-1313.

### GRINNELL COLLEGE

Grinnell, Iowa 50112

One-year position as Assistant Professor or Instructor of Mathematics starting Fall 1989. Candidates will be expected to demonstrate excellence in teaching, and to have a commitment to teaching in a strong liberal arts setting. We seek the best teachers/scholars regardless of mathematical specialty. Send vita and letters of reference to Charles Jones, Chair, Department of Mathematics, Grinnell College, Grinnell, Iowa 50112. The search will remain open until the position is filled; to be assured of consideration, submit all application materials by

February 15. Grinnell College is an Equal Opportunity, Affirmative Action Employer and especially seeks women and minority candidates.

### GRINNELL COLLEGE

Grinnell, Iowa 50112

Tenure-track position, Assistant Professor of Mathematics starting Fall 1989. Candidates will be expected to have the Ph.D. degree, to demonstrate excellence in teaching, and to have a commitment to teaching in a strong liberal arts setting. We seek the best teachers/scholars regardless of mathematical specialty, although candidates who have some training in statistics will be considered somewhat more favorably. Send vita and letters of reference to Charles Jones, Chair, Department of Mathematics, Grinnell College, Grinnell, Iowa 50112. The search will remain open until the position is filled; to be assured of consideration, submit all application materials by February 15. Grinnell College is an Equal Opportunity, Affirmative Action Employer and especially seeks women and minority candidates.

### WASHINGTON STATE UNIVERSITY

#### Mathematics Education

A joint tenure-track position in Mathematics and Education for August 1989. Rank and salary will be commensurate with qualifications and experience. Qualifications include a doctorate in Mathematics Education or a related field, a strong mathematics background, and excellence in research and teaching in mathematics education. Applicants should send a placement file, including a current vita, and have at least three letters of recommendation sent to Dr. C.S. Johnson, Mathematics Education Search Committee, Department of Elementary and Secondary Education, Washington State University, Pullman, WA 99164-2122. The closing date is February 15, 1989, but applications will be considered until the position is filled. WSU is an EO/AA Educator and Employer. Protected group members are encouraged to apply.

### WASHINGTON STATE UNIVERSITY

#### Pure and Applied Mathematics Pullman, WA 99164-2930

The Department of Pure and Applied Mathematics has at least one temporary position available for the academic year 1989-1990 starting August 16, 1989, although the status of this appointment may be upgraded to tenure-track by that date. Applicants must have a demonstrated research ability in COMPREHENSIVE APPLIED MATHEMATICAL MODELING preferably with applications to LIFE SCIENCE PHENOMENA and have the potential to supervise doctoral dissertations. The position requires a Ph.D. with competence in teaching relevant graduate and undergraduate courses. The appointment is planned at the Assistant Professor level but especially qualified senior applicants may also be considered. Applications will be accepted through February 15, 1989, or until position is filled. A curriculum vitae and the names of at least three (3) references should be sent to: Professor David J. Wollkind, Chairman, Life Sciences Mathematical Modeling Search Committee. WSU is an EO/AA Educator and Employer. Protected group members are encouraged to apply.

### ROSE-HULMAN INSTITUTE OF TECHNOLOGY

#### Department of Mathematics

A tenure-track assistant or associate professorship will be available September 1, 1989. Applicants

should have a Ph.D. in mathematics or statistics and a strong commitment to teaching and scholarly activity. Send letter of application, resumé, three letters of recommendation, and graduate transcripts to George Berzsenyi, Chairman, Department of Mathematics, Rose-Hulman Institute of Technology, Terre Haute, IN 47803.

### NATURAL SCIENCES AND MATHEMATICS DEPARTMENT

Trinity College of Vermont  
Burlington, VT 05401

Trinity College invites applications for a faculty position in Mathematics, August 1989. Trinity College uses a system of multiple-year contracts as an alternative to tenure. Ph.D. in math required; emphasis on demonstrated teaching ability. Duties: 24 credit hours of instruction per year, student advising, committee work. Research opportunities: limited but encouraged. Rank and salary depend on qualifications and experience. Application: letter, vita, graduate transcript, one letter of reference, names/addresses/phone numbers of 2-3 additional references. Submit to: Dr. John F. Heinbokel, Chair, Natural Sciences and Mathematics Department, Trinity College, Burlington, VT 05401; review of applications begins 15 Jan. 1989. Applications from women and minorities are encouraged. AA/EOE.

### THE UNIVERSITY OF HARTFORD

The Department of Mathematics and Computer Science has a tenure-track position available beginning September 1989 at the rank of assistant professor. Qualifications include a Ph.D. in mathematics and the ability to teach freshman level programming courses; or a Ph.D. in computer science and the ability to teach freshman level mathematical courses. A dedication to excellent teaching and a strong interest in scholarship are required. Preference will be given to those with established records in these areas. The salary and teaching responsibilities are competitive and commensurate with one's experience.

Those interested should send a resumé and three letters of recommendation to:

Joel Kagan, Chair  
Department of Mathematics  
and Computer Science  
University of Hartford  
West Hartford, CT 06117

The University of Hartford is an equal opportunity affirmative action employer and specifically invites and encourages applications from women and minorities.

### DEPARTMENT OF MATHEMATICS

College of St. Thomas  
St. Paul, Minnesota

Applications are invited for a tenure-track position in mathematics, at the rank of assistant professor beginning September 1, 1989. Candidates should hold a Ph.D. in Mathematics or in Mathematical Statistics. Applications are especially encouraged from those with a background in probability or mathematical statistics. The College is a Catholic comprehensive institution located in the heart of the Twin Cities metropolitan area. It is the largest private college in Minnesota with an enrollment of 8,500 including 5,000 undergraduates. The department has a faculty of 13 and 100 declared undergraduate majors. Applications will be accepted until January 20, 1989 or until the position is filled. A letter of interest, a curriculum vitae, undergraduate and graduate transcripts, and three letters of recommendation

(which should include comments on the candidate's prospects for success as a teacher and a scholar) should be sent to: Richard P. Goblirsch, Department of Mathematics, College of St. Thomas, St. Paul, MN 55105. The College is an Equal Opportunity/Affirmative Action Employer.

### UNITED STATES NAVAL ACADEMY Computer Services

Computer Services invites applications for an Administrative Faculty or Assistant Professor position in applied mathematics or numerical analysis. Major responsibility is to assist faculty with the integration of computer technology into the undergraduate curriculum. Special emphasis will be to develop and provide expertise in parallel processing and super-computing. Must also teach a minimum of one undergraduate course per semester in the area of personal expertise. This is a 12 month position available June 1, 1989.

Applicants must have an earned doctorate by the date of appointment coupled with a strong background in the use of computing in the classroom.

The initial salary will be competitive and commensurate with experience and qualifications.

Send letter of application, resumé, and three letters of recommendation to: Dr. L. Afdahl, Computer Services, U.S. Naval Academy, Annapolis, Maryland 21402-5045.

The U.S. Naval Academy is an Equal Opportunity and Affirmative Action Employer.

### UNIVERSITY OF GUAM College of Arts and Sciences Division of Science and Mathematics Department of Mathematics

The Department of Mathematics at the University of Guam announces six (6) vacancies for the 1989/90 academic year. All positions are at assistant to associate professor level for a 3 year contract, leading to a tenure-track position. Teaching load 12 hours per semester. An earned doctorate will be considered. Previous experience is desirable. Salary \$20,374-\$42,356. Completed application consists of (1) resumé; (2) transcripts; (3) three letters of recommendation; (4) completed application form. Further information and letters of application to:

Chair, Mathematics Search Committee  
College of Arts and Sciences  
UOG Station  
Mangilao, Guam 96923 U.S.A.

Applications completed before March 15, 1989 will receive first consideration.

### KEENE STATE COLLEGE Keene, New Hampshire 03431

Fall 1989. Mathematics tenure-track faculty positions, Assistant/Associate level. Teach introductory and advanced undergraduate courses (12 credits/sem), advise students, review, and plan curriculum. Assistant Professor normally requires college-level teaching and a doctorate in one of the mathematical sciences, but ABD or a master's in math with extensive college teaching experience will be considered. Associate Professor level requires doctorate and 5 years college/university teaching experience as well as a record of scholarly activity. Excellent oral communication skills required. Send resumé and 3 letters of reference documenting teaching excellence to Gaynelle Pratt, Personnel Office, Keene State College, Keene, NH 03431. Non U.S. citizens must include current Visa status. Review of applications will begin January 23, 1989 and

will continue until positions are filled. Representatives from KSC will be at the AMS/MAA meeting in Phoenix.

### PARKS COLLEGE OF SAINT LOUIS UNIVERSITY

#### Faculty Position

The Department of Science and Mathematics is seeking to fill three tenure-track Assistant Professor positions beginning September 1989. Applications will be considered from holders of Ph.D. degrees in mathematics, computer science, physics, chemistry, and meteorology. The nominal application deadline is March 15, 1989, but later applications will be considered until the positions are filled. Noncitizen applicants are requested to state their visa status. Please respond to Dr. John E. Roberts, Chairman, Department of Science and Mathematics, Parks College of Saint Louis University, Cahokia, IL 62206. An Equal Opportunity/Affirmative Action Employer. M/F/H/V.

### ROGER WILLIAMS COLLEGE

#### Mathematics and Computer Science Division

The Division of Mathematics and Computer Science of Roger Williams College welcomes applications for a full-time faculty position beginning in September 1989. The Division offers majors in mathematics and computer science and provides support courses for College programs in science, engineering, business, architecture, psychology, and general education. We seek candidates who would enjoy teaching a variety of major and service courses in mathematics, computer science, or both. The normal teaching load is 4 courses/12 contact hours. ABD required, doctorate and teaching experience preferred. Salaries are competitive and fringe benefits are excellent.

The College enrolls approximately 2,000 full-time students in a variety of liberal arts and professional programs. It is situated in historic Bristol, RI on a bluff overlooking beautiful Narragansett Bay. Boston is about an hour's drive away.

Send a letter of application, curriculum vita, and three letters of reference to: Faculty Search Committee, Division of Mathematics and Computer Science, Roger Williams College, Bristol, RI 02809. Applications received by February 15, 1989 will be given first consideration. Roger Williams College is an Affirmative Action/Equal Opportunity employer.

### MATHEMATICS AND COMPUTER SCIENCE DEPARTMENT

Mathematics/Mathematics Education: Shippensburg University invites applications for a tenure-track position as an assistant/associate professor of mathematics starting September 1989. Qualifications are: (1) Doctorate in mathematics or mathematics education; (2) Research interest in mathematics education and; (3) Equivalent of master's degree in mathematics. Candidates who will be completing their doctoral degree within two years will also be considered. Demonstrated experience and potential in teaching, research, and academic service are also required. Primary responsibility is to teach undergraduate mathematics courses and graduate and undergraduate mathematics education courses, with a maximum of 24 credits per year. Other responsibilities: advise students; serve on committees; conduct research. Applications, including resumé, three letters of reference, and graduate transcripts should be submitted to: Search Committee, Department of Mathematics and Computer Sci-

ence, Shippensburg University, Shippensburg, PA 17257. Application deadline is March 15, 1989.

Shippensburg University is an Equal Opportunity/Affirmative Action Employer. Qualified women and racial minorities are encouraged to apply.

### THE UNIVERSITY OF PITTSBURGH AT JOHNSTOWN

Johnstown, PA 15904

The University of Pittsburgh at Johnstown invites applications for an anticipated tenure-track Assistant Professor position in Mathematics for Sept. 1, 1989. A background in statistics and/or quantitative science, commitment in teaching all levels of undergraduate math, and a strong motivation for continuing professional development are expected. A doctorate in math or a related discipline, or evidence of completing all doctoral requirements by Summer 1989, is required.

Salary and rank are negotiable, dependent on experience and academic qualifications.

Deadline: March 2, 1989 (or until position is filled). Send resumé and supporting papers to Dr. Ildelfonso T. Cruz, Math Search Coordinator, University of Pittsburgh at Johnstown, Johnstown, PA 15904.

UPJ is an Equal Opportunity/Affirmative Action Employer.

### DEPARTMENT OF MATHEMATICS

Boise State University  
Boise, Idaho 83725

Possible tenure-track assistant-professor position starting August 21, 1989. Ph.D. required. Teaching and research expected. New faculty teaching load is two classes (8-10 hours) per semester. The department offers a Bachelor's in mathematical and options in secondary education and in computer science. Applicants in all mathematics sciences are urged to apply. Send letter of application, resumé, graduate transcripts, and 3 letters of reference to the Chairman, Department of Mathematics. EEO/AA Institution.

### ALBION COLLEGE

Albion, Michigan

Tenure-track position at the assistant professor level in mathematics/computer science program. Starts August, 1989. Salary competitive; excellent fringe benefits. Ph.D. in mathematics or computer science with strong background in discrete mathematics. Preference to applicants with computer science coursework/experience and evidence of potential for excellence in teaching. Albion College encourages applications from minority candidates and women. Direct inquiries to R.C. Fryxell, Chairman, Mathematics Department, Albion College, Albion, MI 49224, (517) 629-5511, Ext. 287. (BITNET address: RFRYXELL@ALBION) Albion College is an Equal Opportunity Employer.

### MERRIMACK COLLEGE

Dept. of Mathematics & Computer Science

Two tenure-track positions in mathematics available beginning Fall 1989. Applicants should have a Ph.D. in mathematics. Excellence in teaching of undergraduate students and continued scholarly activity are expected. Teaching load is 12 hours per semester. Preference given for one position to applicants with expertise in geometry and foundations. Merrimack is a small (2,000 students), comprehensive, Catholic college located 25 miles north



of Boston. Send resumé, salary requirements, graduate transcripts, and 3 letters of reference to: Dr. Walter E. Maxery, Chairman, Dept. of Math & C.S., Merrimack College, North Andover, MA 01845. An E.O.E.

### **WESTERN OREGON STATE COLLEGE** **Mathematics Department**

Assistant/associate professor to teach upper and lower division mathematics courses. Earned Doctorate in mathematics required. Experience in teaching mathematics for liberal arts, business, or computer science majors preferred. 9-month, tenure-track, \$23,000 minimum. Send letter, curriculum vitae, transcripts, and 3 recommendations by Jan. 30, 1989: Dr. James Barnard, WOSC, Monmouth, OR 97361.

### **WESTERN WASHINGTON UNIVERSITY** **Department of Mathematics**

Tenure-track and visiting positions to begin Fall 1989. Ph.D. in mathematics required. Candidates especially sought in: (1) Applied mathematics, especially nonlinear differential equations, dynamical systems, optimization. (2) Mathematics education, elementary or secondary teaching experience preferred. Send letter of interest, vita, transcripts, and three letters of recommendation to Thomas T. Read, Chair, Dept. of Math, WWU, Bellingham, WA 98225, by 2/1/89; later application considered if positions remain available. Positions subject to continuing availability of funds. EO/AA.

### **HUNTINGTON COLLEGE**

#### **Department of Mathematical Sciences**

Huntington College invites applications for a position in computer information science and mathematics open for Fall 1989. Minimum MA in computer science or related area; doctorate preferred. Huntington is an evangelical, church-related liberal arts college. Initial screening by February 1 but position open until filled. Resumé and credentials should be mailed to Dr. Gerald D. Smith, Vice President and Dean of the College, Huntington College, Huntington, Indiana 46750. Equal Opportunity Employer.

### **UNIVERSITY OF MISSOURI-ST. LOUIS**

#### **Joint Position in Mathematics and Education**

Tenure-track joint position for Fall 1989 in Mathematics and Secondary Education. Rank/Salary dependent on qualifications. Ph.D. in Mathematics or Mathematics Education required, with experience in education. Send resumé, transcripts, and three letters of recommendation by February 15, 1989 to Jerrold Siegel, Mathematics Education Search Committee, Department of Mathematics and Computer Science, University of Missouri-St. Louis, St. Louis, MO 63121-4499. AA/EEO.

### **THE UNIVERSITY OF SCRANTON** **Departments of Mathematics and Computing Science**

The University of Scranton is a Jesuit university with over 3,500 undergraduates. At least one tenure-track position is available in Fall 1989 for faculty interested in a teaching environment. Individuals with expertise in any area of mathematics or computer science will be considered. Research is encouraged and supported through a strong faculty development program. Rank and salary are

open and competitive. The two departments currently have 22 full-time faculty and about 300 majors. The University has a campus-wide commitment to computing including a faculty PC purchase program. Submit a vita, transcripts, and three references to Mathematics/Computing Science Search Committee, University of Scranton, Scranton, PA 18510 or phone (717) 961-7774. An AA/EEO Employer and Educator

### **THE AMERICAN UNIVERSITY**

Two tenure-track positions available in Fall 1989 as Assistant Professors of Mathematics in the Department of Mathematics and Statistics.

Qualifications: Ph.D. in Mathematics; evidence of scholarship and research. Preferred areas of research are numerical analysis with other areas considered.

Responsibilities: Undergraduate and graduate teaching, advising, scholarship, and University service.

Competitive salary, commensurate with qualifications and experience. Positions subject to final budgetary approval. Send c.v. and names of three references to Basil Korin, Chair, Department of Mathematics and Statistics, The American University, Washington, D.C. 20016. Preference given to applications received by February 28, 1989. An EEO/AA University; minority and women candidates are encouraged to apply.

### **CENTRAL COLLEGE**

#### **Department of Mathematics and Computer Science Pella, Iowa 50219**

Central College is accepting applications for two instructors in mathematics/computer science. Appointments will be made at the instructor or assistant professor level, are renewable, and one of the positions is a tenure-track position. Faculty teach a variety of undergraduate courses in mathematics and/or computer science and share in departmental governance. Ph.D. preferred, M.S. required. Average teaching load is 12 hr/week. Send application, resumé, and three letters of reference to W.H. Bearce, Dean of the College, Central College, Pella, IA 50219. Review of applications will begin February 15. EOE.

### **UNIVERSITY OF SOUTHERN COLORADO**

#### **Department of Mathematics Pueblo, CO 81001-4901**

Applications are invited for several, anticipated, tenure-track assistant professor positions for Fall 1989. Doctorate in mathematics required. All areas will be considered. Preferred areas are: combinatorics/Geometry, Numerical Analysis, Matrix Methods/Applied Mathematics, or Probability/Analysis. Evidence of outstanding teaching ability and active research necessary. Send resumé, graduate transcripts, and three letters of reference to Search and Screen Committee. Evaluation of applications will begin 7 February and continue until positions are filled. USC is an AA/EEO Employer.

### **MATHEMATICAL EDUCATION**

The Department of Mathematics at Southwest Missouri State University invites applications for a tenure-track position as an Assistant or beginning Associate Professor in Mathematics Education. A doctorate with a strong background in mathematics is required. Demonstrated excellence in teaching

and strong research potential are required. A record of research, success in obtaining grants, and secondary teaching experience are desirable. Duties include teaching (content and methods courses), research, and service. Starting date is Fall 1989. Deadline for application is March 1, 1989. Send applications (resumé, three current letters of reference, graduate transcripts, and a letter of interest) to: Dr. M. Michael Awad, Head, Department of Mathematics, Southwest Missouri State University, Springfield, MO 65804-0094. AA/EEO.

### **POTSDAM COLLEGE OF THE STATE UNIVERSITY OF NEW YORK**

#### **Department of Mathematics**

One tenure-track position in Mathematics. Rank and salary open. Teach up to 12 hrs. undergraduate and beginning graduate Mathematics. Ph.D. in any area of Mathematics. (Near completion ABD will be considered.) To start Sept. 1, 1989. Send letter of application, resumé, graduate transcripts, and 3 letters of reference to: Dr. A.E. Spencer, Search Committee Chair, Mathematics Dept., SUNY Potsdam, Potsdam, NY 13676. Applicant review will begin Feb. 1, 1989 and continue until position is filled. Potsdam is committed to providing opportunities for women and minorities and actively seeks these candidates.

### **WEST TEXAS STATE UNIVERSITY**

#### **Department of Mathematics and Physical Sciences**

Applications are invited for a tenure-track position as assistant professor of mathematics, beginning Fall 1989. A Ph.D. in mathematics is required. Send resumé to Dr. Vaughn Nelson, Head, Department of Mathematics and Physical Sciences, Box 787, Canyon, Texas 79016. AA/EEO Employer.

### **DEPARTMENT OF MATHEMATICS**

#### **University of Wisconsin-Eau Claire Eau Claire, Wisconsin 54702-4004**

One or more tenure-track faculty positions. All specialties considered, with some preference to those in statistics or geometry, especially those with interest and experience in teaching upper-level undergraduate courses in geometry. Doctorate strongly preferred, and tenure without the doctorate is unlikely. Twelve-hour teaching load in a primarily undergraduate teaching institution which has graduate programs teachers and which actively encourages research and scholarly activities. Applicants must present evidence of potential for excellence in teaching. One- or two-year initial appointment. Closing date for applications: February 15, 1989, or until positions are filled. Send letter of application, resumé, graduate and undergraduate transcripts, and three letters of recommendation to: Dr. Marshall E. Wick, Chairman, at the above address. *University of Wisconsin-Eau Claire is an equal opportunity, affirmative action employer.*

### **THE DEPARTMENT OF MATHEMATICAL SCIENCES**

#### **Bentley College**

The Department of Mathematical Sciences anticipates an opening for one tenure-track position starting in Fall '89. A Ph.D. in Mathematics, Statistics, Quantitative Methods, Operations Research, or related field is required. Salary and benefits are competitive and are based on an applicant's scholastic and professional accomplishments.

Located in suburban Boston, Bentley College has long been known for its leadership in the education of business professionals. In recent years, the school has experienced dramatic growth and currently enrolls 8,000 graduate and undergraduate students. While heavy emphasis continues to be placed on quality teaching in the evaluation of faculty, research is not only encouraged by is expected as the department grows in size and stature.

Current vitae, teaching evaluations, and copies of recent publications should be sent to:

Dr. David H. Carhart, Chairman  
Department of Mathematical Sciences  
Bentley College  
Waltham, MA 02254

Bentley College is an Equal Opportunity/Affirmative Action Employer.

### UNIVERSITY OF EVANSVILLE Department of Mathematics

Applications are invited for a tenure-track position as assistant professor of mathematics beginning August 1989. Ph.D. in mathematics and strong commitment to teaching required. Some background in combinatorics and/or numerical methods preferred. Responsibilities include teaching 9-12 hours per semester in a wide range of mathematics courses, continuing scholarly activities, and University service. Send application letter, resumé, transcripts, and 3 letters of reference to:

Dr. J. Robert Knott, Chairman  
Mathematics Department  
University of Evansville  
Evansville, Indiana 47722

### MATHEMATICS

Tenure-track position, beginning September 1989. Candidate should hold doctorate, college teaching experience preferred. Deadline March 1. AA/EEO. Send vita and list of references to Dean Draghi, Marymount University, 2807 N. Glebe Rd., Arlington, VA 22207

### ST. CLOUD STATE UNIVERSITY

The Department of Mathematics and Statistics invites applications for five tenure-track positions at the rank of Assistant or Associate Professor to begin September 1989. Two positions require specialization in mathematics education, the others are open to all areas of specialization. Applicants must have a commitment to undergraduate education, excellent teaching credentials, and a record of strong potential for scholarly and professional activity. A doctorate is preferred, but ABDs are encouraged to apply. Send resumé, transcripts, and arrange for three letters of recommendation to be sent to Gail Earles, Chairperson, Dept. of Math and Stat, St. Cloud State University, St. Cloud, MN 56301. To assure consideration, applications should be completed by Feb. 10, 1989. Women and minorities are encouraged to apply. SCSU is an Equal Opportunity/Affirmative Action Employer.

### CHRISTIAN BROTHERS COLLEGE Department of mathematics and Computer Science Memphis, TN 38104

The Department is seeking to fill two full-time appointments for the 1989-1990 academic year. One position is to replace a faculty member who will be on sabbatical leave. The duties include teaching

four courses per semester in undergraduate mathematics. The applicant must possess at least a Master's Degree in mathematics. The position could develop into tenure-track for the successful Ph.D. applicant. The other position is a tenure-track position in computer science. The applicant must possess at least a Master's Degree in computer science. Successful teaching experience is required for both positions.

Qualified candidates may apply by submitting a letter of application, resumé, college transcripts, and three letters of recommendation (two of which address teaching) to:

Dr Lawrence Gulde  
Head, Department of Mathematics

EOE/AA

### NSA SABBATICAL PROGRAM

The National Security Agency (NSA), one of the nation's largest employers of mathematicians, is making efforts to strengthen its ties with the academic mathematical community. One such effort is the NSA's new Mathematical Sabbatical Program.

The sabbatical work primarily involves cryptanalysis, a mathematically based discipline. In addition, algebra, probability, statistics, number theory, and discrete mathematics are involved in the work.

The sabbaticals run 9 to 24 months and have flexible starting dates. In addition to stipends at least equal to the participants' salaries, the NSA provides either an allowance for moving expenses or a housing supplement.

The NSA offers in-house publications, continuing colloquia, cooperative education programs, summer workshop programs, and occasional meetings that provide opportunities to interact with mathematicians both within and outside the agency.

The deadline for applications is August 1, 1989. For more information, contact:

Marvin C. Wunderlich, Director  
NSA Mathematics Sabbatical Program  
National Security Agency  
ATTN: RMA National Security Agency  
Fort George G. Meade, MD 20755-6000  
Telephone: 301-859-6438

U.S. citizenship required for applicant and immediate family members. An Equal Opportunity Employer.

### FORT LEWIS COLLEGE

Fort Lewis College, Durango, CO, Math Department anticipates a tenure-track position will be available for the 1989-1990 year. Terminal degree or evidence of completion is required. Twelve hours of undergraduate teaching, mixed math and CS. FLC is a state-supported liberal arts college of 3,800 in southwest Colorado. Send a letter of application, resumé, transcript, three current letters of recommendation, including one that clearly addresses teaching to: H.C. Rosenberg, Chair, mathematics Dept., Fort Lewis College, Durango, CO 81301. Deadline is February 13, 1989. FLC is an AA/EEO Employer.

### SONOMA STATE UNIVERSITY

Department of Mathematics  
Rohnert Park, California 94928

Sonoma State University is one of the 19 campuses of The California State University, located 45 miles north of San Francisco. Applications are invited from Ph.D.'s in mathematics for one tenure-track faculty position in mathematics, preferably in statistics or applied mathematics, beginning in Fall 1989.

Applicants must have a strong commitment to excellence in teaching and are expected to teach undergraduate major and service courses in statistics and mathematics. Please send a letter of application, curriculum vitae, a current teaching evaluation (if available); and direct three letters of reference to Dr. Jean B. Chan. Closing date for applications is February 8, 1989. An AA/EEO employer.

### MATHEMATICS DEPARTMENT

Washburn University  
Topeka, KS 66621

Tenure-track faculty position beginning August 21, 1989. Qualifications: Doctorate in Mathematics or Mathematics Education or expect to complete all requirements by December 31, 1989. The doctorate is required for rank of Assistant Professor. Experience in elementary or secondary teaching is desirable, as is experience in utilizing computers in the classroom. Interest in working with elementary and secondary preservice teachers is essential. Responsibilities include teaching undergraduate mathematics for elementary education majors and mathematics for liberal arts students. Scholarly activity is required for promotion and tenure. Salary is commensurate with qualifications. Send vita, transcripts, and three letters of reference to Dr. Allan Riveland by February 15, 1989. Washburn University is an Equal Opportunity/Affirmative Action Employer.

### COLLEGE OF THE SEQUIAS

College of the Sequoias invites applications for a full-time instructor to teach mathematics beginning in August 1989. Responsibilities include teaching lecture courses from arithmetic level through calculus. Will assist in the development of the mathematics instruction curriculum. Preference will be given to those candidates with prior teaching experience. A Master's Degree in mathematics or a closely related field and a valid California Community College Credential are required. Completed application must be received by January 30, 1989. Contact: Office of Personnel Services, College of the Sequoias, 915 South Mooney Blvd., Visalia, CA 93277; (209) 733-2050. Equal Opportunity Employer.

### KENNESAW COLLEGE

The Department of Developmental Studies is accepting applications for a teaching position in developmental mathematics. A doctorate in mathematics or mathematics education is preferred; a Master's in one of those areas is required. Applicants should have expertise and interest in teaching pre-college and college mathematics. Rank, salary, and tenure-track status are negotiable and commensurate with education and experience.

Send detailed resumé with a list of three references and a letter describing qualifications to Dr. Elaine Hubbard, Department of Developmental Studies, Kennesaw College, P.O. Box 444, Marietta, Georgia 30061. Applicant screening begins March 1, 1989, but applications will be accepted until the position is filled.

Kennesaw College is an Affirmative Action, Equal Opportunity Employer.

### UNIVERSITY OF MICHIGAN-DEARBORN

Univ. of Michigan, Dearborn, Dept. of Math & Stat., Dearborn, Michigan 48128. Search Co-chairs James Brown and Ronald Morash. The U of M-Dbn plans to fill a tenure-track position starting in Sept.

1989. It is at the Asst. Prof. level and requires a Ph.D. in Mathematics. A research interest in an applied area is preferred. Teaching capability in an applied area of mathematics or in statistics is also a plus for this position. The teaching load is 9 credit hours per term. To apply, send resumé and have 3 letters of recommendation sent to James Brown, Co-chair, Search Committee, the Univ of Mich Dbn is an Equal Opportunity Employer and specifically invites and encourages applications from women and minorities.

### NAZARETH COLLEGE

The Math/CS Department invites applications for a tenure-track position at the rank of Assistant Professor beginning August 1989. We offer an innovative B.S. degree in Computer and Information Science which integrates technical computer science courses with basic business skills without diluting the depth and breadth of our commitment to the liberal arts and quality instruction of undergraduates. The candidate should have an interest in Database, MIS, Business Applications, Data Communications, and the ability to teach introductory mathematics courses. Advanced degree in Computer Sciences and Ph.D. in related area required. Applications will be considered as received until position is filled or April 1, 1989. Send current vita, official transcripts, evidence of teaching ability, and three letters of recommendation to: Dr. Judith Rose, Chairperson, Department Math/CS, Nazareth College, 4245 East Ave., Rochester, NY 14610.

### POMONA COLLEGE

#### Tenure-Track Position

Tenure-track position at Assistant Professor rank in the mathematical sciences beginning in the fall of 1989. Requires Ph.D. with demonstrated effectiveness in teaching and strong research capability. Must be able to teach a variety of undergraduate courses, and provide intellectual leadership for our majors. Pomona college, founding member of The Claremont Colleges, offers the opportunity to teach excellent undergraduates in a small liberal arts college environment while participating in a larger intercollegiate mathematical community of over 30 mathematics Ph.D.'s, active in research. Please submit applications, including resumé, transcripts, and letters of reference to Professor Richard Elderkin, Chair, Search Committee, Department of Mathematics, Millikan Laboratory, Pomona College, Claremont, CA 91711-6348. Search closes after February 1 whenever the position is filled. Pomona College is an Affirmative Action/Equal Opportunity Employer and encourages applications from minority candidates and women.

### MILLERSVILLE UNIVERSITY OF PENNSYLVANIA

#### Department of Mathematics and Computer Science

Applications are invited for an expected full-time tenure-track position in secondary mathematics education beginning September 1989. Candidates must hold a doctoral degree in mathematics education or mathematics with experience in math education and have a strong commitment to teaching. Appointment at the Assistant Professor level is expected. Preference will be given to candidates with experience teaching mathematics at the secondary school level. Teaching load is 24 semester hours per year. Primary course responsibilities for this position will be within the undergraduate and graduate mathematics education programs. Teaching other undergraduate mathematics courses is also expected.

The department consists of 26 full-time faculty serving approximately 175 mathematics majors (of whom more than 100 are in secondary education) and 200 computer science majors. Mathematical specialists among the faculty include mathematics education, statistics, tomography, algebraic topology, graph theory and combinatorics, real and complex analysis, algebra, and differential equations. The department offers both B.S. and M.Ed. degrees in Mathematics Education.

Millersville University enrolls more than 7,000 students; it is the oldest of the 14 universities in the Pennsylvania State System of Higher Education. The campus is located in a suburb of Lancaster; the County offers a safe, pleasant life-style and climate with easy access to Philadelphia, New York City, Washington D.C., the New Jersey Shore, Pocono resorts, and the Chesapeake Bay.

Send vita, transcripts, and three letters of recommendation (at least two of which attest to your teaching effectiveness to:

Dr. Charles G. Denlinger  
Search Committee Chairman, FC01  
Department of Math & Computer Science  
Millersville University  
Millersville, PA 17551

Interviews will begin about 1 February 1989. Millersville earnestly seeks applications from minority and women candidates. Millersville is Affirmative Action/Equal Opportunity Employer.

### ST. PETER'S COLLEGE

The Department of Mathematics invites applications for one or two tenure-track positions to begin Fall 1989. Ph.D. or Master's with significant current progress toward Ph.D. required. Applicants must have strong interest in teaching service and major courses for undergraduate in an urban setting. Some preference may be given to applicants with background in OR or developmental mathematics. Please send resumé, transcripts, and three current letters of reference to B.M. Kiernan, Mathematics Department, Saint Peter's College, Jersey City, NJ 07306 by March 1, 1989. SPC is AA/EOE.

### VALPARAISO UNIVERSITY

#### Department of Mathematics and Computer Science

If you are interested in contributing to a growing and dynamic undergraduate math program, you are invited to apply for a tenure-track position. Qualifications desired: Ph.D. in Math with expertise in (1) Analysis or (2) Operations Research and/or Math Modeling or (3) Secondary Education. Background in Computer Science helpful. Salaries competitive. Rank dependent upon qualifications. Closing date Jan. 31, 1989. Valparaiso University is a private university in the Lutheran tradition, and an EO/AA employer. Send letter of application and resumé to William Marion, Chairperson, Valparaiso, IN 46383.

### GEORGIA SOUTHERN COLLEGE

Applications are invited to fill four tenure-track positions in the Mathematics and Computer Science Department. An advanced degree in a mathematical science or computer science is required and a doctorate is preferred. Applications are sought from all areas of pure and applied mathematics, and computer science, although a special effort will be made to fill one of the positions with someone having expertise in computer networking and communications. Rank (instructor or assistant professor preferred; associate professor considered) and salary

commensurate with qualifications. The Department provides support for personal research. There are, in addition, several temporary instructor positions to teach freshman mathematics for which a master's degree in mathematics is required.

Send evidence of, or document potential for, outstanding teaching, along with curriculum vitae, and three letters of reference or placement file to Dr. Rick Hathaway, Landrum Box 8093, Georgia Southern College, Statesboro, GA 30460. Deadline: March 1, 1989.

Georgia Southern College is the largest and most comprehensive of the 15 senior colleges of the University System of Georgia. Enrollment growth of 51% has been experienced over the past four years and the projected enrollment for the fall of 1989 is 10,500 students. The 457-acre campus is located in Statesboro, 50 miles northwest of historic Savannah and 200 miles southeast of Atlanta.

All positions are available September 1, 1989. Georgia Southern College is an Affirmative Action, Equal Opportunity Employer which invites and encourages applications from women and minorities.

### THE VIRGINIA MILITARY INSTITUTE

#### Mathematics/Computer Science

Applications are invited for a tenure-track position in the Mathematics and Computer Science Department beginning August, 1989. The applicant should have a strong interest in teaching and participating in the continued development of the computer science degree program. VMI began offering a B.S. in computer science last year and now has 53 students either as majors or minors (VMI's total enrollment is 1,300). The computer science laboratory contains a Data General MV/7800 with 20 terminals. VMI also has a Burroughs A9 and approximately 200 IBM PC's for student and faculty use.

Preference will be given to an applicant with a Ph.D. in a computer-related field such as Computer Science, Management Information Systems, Mathematics, or Operations Research. If the degree is not in Computer Science, the applicant must have significant formal education or experience in Computer Science. Duties include teaching both mathematics and computer science courses. Salary and rank are commensurate with degrees, qualifications, and experience.

VMI is a quality undergraduate military college of engineering, liberal arts, and science, located in an attractive college town. Faculty wear uniforms but have no other assigned military duties.

The deadline for applications is March 1, 1989. Candidates should send resumé with at least three reference to Thomas C. Lominac, Department of Mathematics and Computer Science, Virginia Military Institute, Lexington, VA 24450.

AA/EEO Employer

### UNIVERSITY OF SOUTH CAROLINA

#### Department of Mathematics

Applications are invited for anticipated tenure-track faculty positions at all ranks. Applications in all areas of mathematics will be considered. The Department seeks to build on existing research strengths and to increase the scope of its programs, particularly in applied and computational mathematics. Faculty research is supported by excellent in-house library and computing facilities. The Department's computer center supports network access to the University's FPS array processor and 1,024 node hypercube supercomputer. The Ph.D. degree or its equivalent is required, and all appointments will

be consistent with the Department's commitment to excellence in research and teaching at the undergraduate and graduate levels. A detailed resumé, containing a summary of research accomplishments and goals, and four letters of recommendation should be sent to:

Dr. Colin Bennett, Chairman  
Department of Mathematics  
University of South Carolina  
Columbia, South Carolina 29208

The deadline for applications is March 31, 1989. The University of South Carolina is an Affirmative Action/Equal Opportunity Employer.

### PHILLIPS EXETER ACADEMY

Coed boarding school 9-12. Full-time position in mathematics, beginning September, 1989. Duties include teaching four courses, dormitory supervision, athletic coaching. Courses: beginning algebra through BC calculus, discrete mathematics, advanced topics. Applicants should have done graduate study in mathematics and several years teaching, preferably in boarding school. Inquiries, accompanied by vita and reference to:

Andrew W. Hertig  
Dean of Faculty  
Phillips Exeter Academy  
Exeter, New Hampshire 03833  
EOE

### ASHLAND COLLEGE

#### Tenure-Track Faculty Position

The Department of Mathematics invites applications for a position in Computer Science beginning with Fall 1989 semester. Candidates must have at least a master's degree in Computer Science. The responsibilities include a 12 semester hour teaching load per semester in Computer Science or related mathematics courses, advising, participation in further development of the Computer Science program of study, and other college committee duties. Rank and salary will depend on qualifications and experience.

Ashland College is a liberal arts institution with 1,450 full-time students, located in Ashland, Ohio, midway between Cleveland and Columbus. There are six full-time faculty in the department.

Applicants should submit resumé, transcripts, and letter of recommendation to:

Dr. Duncan Jamieson, Dean  
School of Science  
Ashland College  
Ashland, Ohio 44805

Application deadline is March 15, 1989.

Ashland College is an Equal Opportunity/Affirmative Action Employer.

### BARD COLLEGE

#### Tenure Track Position in Mathematics

Applications are invited for a tenure-track position in Mathematics at Bard College for the Fall of 1989. Bard is a liberal arts college with a young and expanding Mathematics Department. We are seeking someone with a strong interest in building an innovative mathematics program in a liberal arts context. Candidates must have a Ph.D. by the Fall of 1989, and a commitment to teaching and continued mathematical activity. Salary and rank depending on experience. To apply, submit a resumé, a statement of teaching and research interests, and 3 letters of recommendation (at least one concerning teaching

to Prof. Ethan Bloch, c/o Dean's Office, Bard College, Annandale-on-Hudson, NY 12504. Deadline for applications is 1/1/89; late applications will be considered until the position is filled. For more information, call 914-758-6822, exts. 266, 267. Bard will have representatives at the AMS Employment Register at the Jan. 1989 meeting in Phoenix. Bard College is an Equal Opportunity/Affirmative Action Employer.

### NORTHERN KENTUCKY UNIVERSITY

#### Department of Mathematics and Computer Science

Three tenure-track positions beginning in August of 1989. One position is in computer science. Areas for the other two positions are open. Persons in secondary or middle school mathematics with a strong mathematics background and persons in OR are particularly encouraged to apply. Responsibilities include undergraduate teaching (12 hrs./semester), scholarly activity, and service. The emphasis is on quality teaching. A doctorate is required. ABD's will be considered provided all requirements for the doctorate will be met by August 15, 1989.

The department has 25 full-time and 14 part-time faculty members and 288 majors. NKU is located seven miles from downtown Cincinnati, OH.

Review of applicants will begin February 15, 1989. Apply to: Professor Frank Dietrich, Chair of Search Committee, Department of Mathematics and Computer Science, Northern Kentucky University, Highland Heights, KY 41076.

NKU is an Affirmative Action/Equal Opportunity Employer and actively seeks the candidacy of minorities and women.

### PENN STATE HARRISBURG THE CAPITAL COLLEGE

#### Computer Science/Mathematics

The Department of Mathematical Sciences and Computer Science at Penn State Harrisburg invites applications for a tenure-track position with primary responsibility in computer science. Candidates should hold a Ph.D. in computer science or mathematics and be committed to high quality teaching of junior, senior, and master's level courses. Research is required and consulting is encouraged.

Penn State Harrisburg is an upper division and graduate center with an enrollment of over 3,100. The department has programs leading to baccalaureate degrees in Mathematical Sciences and Computer Science and provides courses for undergraduate programs in Engineering Technology, Elementary Education, and Business as well as graduate programs in Engineering and Business Administration. Master's level programs in Computer Sciences and Applied Statistics are under consideration. The department has 10 full-time positions and approximately 70 majors.

Applications will be accepted until the position is filled. Applicants should forward vitae, transcripts, and the names of three references to: J.S. Hartzler, Chair, Mathematical Sciences/Computer Science, Penn State Harrisburg, c/o R.H. Hamill, Box-FO, Middletown, PA 17057. An Affirmative Action/Equal Opportunity Employer. Women and Minorities Encouraged to Apply.

### UNIVERSITY OF MICHIGAN-DEARBORN

Tenure-track position at Assistant/Associate Professor level available at the University of Michigan-Dearborn starting 9/89. Appointment in the Department of Mathematics with primary responsibilities in

Interdisciplinary Computer Science program (Business, Engineering, Mathematics). Ph.D. in one of the computer or information sciences with graduate level work in one of the mathematical sciences or a Ph.D. in one of the mathematical sciences with a Master's degree or equivalent in one of the computer or information sciences required. Nine hour teaching load per semester, released time for research available to junior faculty. The Dearborn campus is one of three in the University of Michigan system. Send a vita, three letters of recommendation, and official transcripts to: Chair, Search Committee, Dept. of Mathematics, University of Michigan-Dearborn, Dearborn, MI 48128-1491. The University of Michigan is an Equal Opportunity Employer and specifically invites and encourages applications from women and minorities.

### DEPARTMENT OF MATHEMATICS AND STATISTICS

#### California State University, Chico Lecturer in Mathematics

The Department of Mathematics and Statistics is seeking mathematicians or statisticians for one or more one-year, full-time temporary leave or replacement positions for the 1989-90 academic year. A Ph.D. in Mathematics or Statistics and evidence of teaching excellence, are required. Duties include teaching 12 units of undergraduate mathematics and carrying out scholarly research. The salary range is \$27,588-\$52,968 per academic year, depending on the level of appointment.

California State University, Chico, a member of the California State University system, enrolls 16,000 students and has 30 full-time faculty members in the Department of Mathematics and Statistics. Chico is a community of 60,000 persons in the northern Sacramento Valley.

Qualified candidates should submit a resumé, graduate transcripts, supporting documents, and at least three letters of reference to:

Thomas A. McCready, Chair  
Department of Mathematics and Statistics  
California State University, Chico  
Chico, CA 95929-0525

The closing date for applications is February 15, 1989. CSU at Chico is an Equal Opportunity/Affirmative Action Employer and employs only individuals lawfully authorized to work in the United States.

### THE KING'S COLLEGE

#### Briarcliff Manor, NY 10510

The King's College, an independent, conservative evangelical Christian liberal arts college has a tenure track teaching position in the Department of Mathematical Sciences and Physics at the Assistant or Associate professor level, teaching computer science courses. Applicants must have a master's degree in computer science and adhere to the college standards of conduct and belief. The College is located approximately 30 miles north of New York city in Westchester county, overlooking the Hudson river. Send letter of application and resumé to: Dr. Rex M. Rogers, Vice President for Academic Affairs. The King's College is an Equal Opportunity Employer.

The Calvin College Department of Mathematics and Computer Science will have one tenure-track opening for the 1989-90 academic year. Applicants in Mathematics Education, Computer Science, and Mathematical Statistics will be considered. The department currently has eighteen full-

time faculty positions and nearly one-hundred majors at the junior-senior level. Calvin College is a Christian liberal arts college, and each faculty member is expected to demonstrate a Reformed and Christian perspective in her or his teaching and other professional activities. To apply, contact Professor S. Leestma, Chairman, Dept. of Mathematics and Computer Science, Calvin College, Grand Rapids, MI 49506. Calvin College is an Equal Opportunity, Affirmative Action Employer.

## HEAD, DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

### Western Carolina University

Applications are invited for the position of Head, Department of Mathematics and Computer Science. The department has eighteen full-time faculty members and offers programs leading to the B.S., B.S.Ed., M.S., M.A.Ed. degrees with majors in mathematics, and the B.S. degree with a major in computer science. Western Carolina University has an enrollment of 6,000 and is a member of the University of North Carolina system. The successful candidate should have a terminal degree, sustained record of quality teaching, research, and service, and an interest in both undergraduate and graduate program development, as well as administrative experience and/or potential.

Applicants should send a resumé, graduate transcripts, and three letters of reference to: Dr. Henry R. Mainwaring, Chair, Mathematics Search Committee, School of Arts and Sciences, Western Carolina University, Cullowhee, NC 28723. WCU is an Equal Opportunity/Affirmative Action Employer. Closing date for receipts of applications is March 1, 1989.

## MUHLENBERG COLLEGE

### The Truman Koehler Professorship in Mathematics

Applications are invited for a tenure-track professorship beginning in August, 1989. Applicants must have a Ph.D. in the mathematical sciences and have demonstrable competence in both teaching excellence and creative research.

Muhlenberg College is an independent, undergraduate, coeducation institution, located in Allentown, Pennsylvania, in the picturesque Lehigh Valley, just south of the Pocono mountains, approximately 55 miles north of Philadelphia and 90 miles west of New York City.

Applicants should submit a letter of application, a resumé, and the names of three references to Dr. John Meyer, Head, Department of Mathematics, Muhlenberg College, Allentown, PA 18104. The screening process will begin in early January, with the possibility of preliminary interviews at the Phoenix meetings, but applications will continue to be accepted until the position is filled. EOE.

## UNIVERSITY OF WISCONSIN-OSHKOSH

The Department of Mathematics at the University of Wisconsin-Oshkosh anticipates having two or more entry level tenure-track positions beginning September 1, 1989. A Ph.D. in one of the Mathematical Sciences is required. Good teaching is essential. The primary responsibility is undergraduate teaching, with the opportunity for some graduate teaching. The usual teaching load is three courses per semester. Scholarly activity is required and, where appropriate, pursuit of extramural funding is expected. The department anticipates a need for faculty in Computational Mathematics, Mathematics Education, and Statistics. However, all areas

of specialization will be considered. Screening of candidates will begin January 23, 1989 and continue until the positions are filled. Send letter of application, resumé, official transcripts, and three current letters of recommendation to: N.J. Kuenzi, Chairman, Department of Mathematics, University of Wisconsin-Oshkosh, Oshkosh, WI 54901. The University of Wisconsin-Oshkosh is an Affirmative Action/Equal Opportunity Employer.

## THE UNIVERSITY OF TENNESSEE AT MARTIN

The University of Tennessee at Martin is a primary campus of the University of Tennessee with an enrollment of 4,500. UTM emphasizes excellence in undergraduate education. We seek candidates with a similar commitment. Martin is a town of 9,000 in Northwest TN.

**Mathematics** - position effective Aug. 89, Ph.D. in mathematics or statistics and teaching experience expected. Teaching load 12 hours per semester; advising; curriculum development.

**Computer Science** - position effective Aug. 89, Ph.D. in computer science or related area and teaching experience expected. Teaching load 12 hours per semester; advising; curriculum development.

Send resumé, transcripts, and three references to Chairman, Math and Computer Science, UTM, Martin, TN 38238. Screening will begin Feb. 15, 1989; applications accepted until the positions are filled. UTM is an Affirmative Action/Equal Opportunity Employer. We are particularly interested in receiving nominations of and applications from minority candidates.

## CANISIUS COLLEGE

### Department of Mathematics

A second tenure-track position (Assistant Professor) in mathematics is available in late August 1989. Applicants should have a Ph.D. in mathematics and a strong commitment to quality teaching. Salary and fringe benefits are competitive and commensurate with credentials and experience.

Applicants should send resumé, transcripts, and three letters of recommendation to Dr. Richard Escobales, Chairman, Department of Mathematics, Canisius, Buffalo, NY 14208.

The Department is looking to expand its offerings and options while at the same time maintaining its sound preparation for students with mathematical potential. AA/EOE.

## APPALACHIAN STATE UNIVERSITY

### Department of Mathematical Sciences

**STATISTICS:** A tenure-track position is available beginning August 1989 at Appalachian State University. A Ph.D. in Statistics or equivalent is required with interest in applied statistics preferred. Strong commitment to teaching both service and major courses is expected; however, research is encouraged and supported. The Department of Mathematical Sciences has 36 full-time faculty members and is housed in the College of Arts and Sciences. Undergraduate programs include Statistics, Applied Mathematics, Computer Science, General Mathematics, and Mathematics Education. Master's programs are offered in Applied Mathematics, General Mathematics, and Mathematics Education. Located in the Blue Ridge Mountains of western North Carolina. Appalachian State has an enrollment of 11,000 and is a member of the University System

of North Carolina. To apply, send a letter of application, resumé, graduate transcripts, and three current letters of recommendation to: H.W. Paul, Search Committee S, Department of Mathematical Sciences, Appalachian State University, Boone, NC 28608. Completed applications should be received by February 1, 1989. Appalachian State University is an Equal Opportunity Employer.

## THE NORTH CAROLINA SCHOOL OF SCIENCE AND MATHEMATICS

### Director

The North Carolina School of Science and Mathematics invites applications and nominations for the position of Director to take office on July 1, 1989. Reporting to the board of Trustees, the Director serves as the Chief Executive Officer of the School.

NCSSM is the nation's first state-supported, state-wide residential school for eleventh and twelfth graders who are academically talented in science and mathematics. Since its opening in 1980, the School has become a national and international model and innovator in curriculum development. The school's comprehensive high school curriculum enrolls 550 students, one-third of whom are National Merit Semifinalists. The student/faculty ratio is 10:1. All faculty members hold a master's degree, 36% hold a Ph.D. An affiliate school of the University of North Carolina, NCSSM is located in the heart of the Research Triangle Park area and benefits from many cooperative arrangements with local research industries and four major universities. The school has an extensive outreach program, including workshops for teachers from other schools, and administers a summer enrichment program at five university campuses around the state for 750 high school students.

The Search Committee is seeking candidates with the following characteristics:

(1) a distinguished record of professional success and an understanding of the reform movement in science and mathematics education for talented high school students; (2) a keen awareness of the unique nature of a residential learning environment of adolescents; (3) visionary leadership and the ability to inspire others; (4) strong communications, organizational, and management skills; (5) talents to work with constituents external to the School—local, state, and national; (6) skills necessary for resource development; (7) experience in working effectively with a governing board; (8) acceptable academic qualifications with an earned doctorate preferred.

Nominations should include the nominee's current address. Applications should include a letter of interest, a resumé, and the names, addresses, and telephone numbers of five (5) references.

Nominations and applications should be received by January 15, 1989. All correspondence should be addressed to:

Bland W. Worley, Chairman  
Director's Search Committee  
P.O. Box 2477  
Durham, NC 27705  
Equal Opportunity Employer

## THE NORTH CAROLINA SCHOOL OF SCIENCE AND MATHEMATICS

### Mathematics Instructor

The N.C. School of Science and Mathematics (NCSSM) offers unique career opportunities in mathematics.

NCSSM will fill this full-time (10 month) faculty position in response to a planned growth in the stu-

dent body. The student body will total 550 in 1989-1990, one third of which are National Merit Semifinalists. Located in the heart of North Carolina's culturally rich Research Triangle Park area, NC-SSM is the nation's first statewide residential, public high school for 11th and 12th grade students with exceptional talent in science and mathematics. It has served North Carolina since 1980 by providing teacher summer workshops and other outreach activities and is charged with the responsibility of being a leader in the nation's efforts to reform high school curriculum.

General requirements: enthusiasm; high energy; doctorate or master's degree in subject field; teaching experience preferably with advanced students; experience and commitment in curriculum design; and a willingness to participate in residential school program including social, recreational, and advisory responsibilities at times other than the usual school hours. Candidates should be comfortable teaching mathematics courses from the algebra II level through third semester calculus and discrete mathematics and beginning computer science courses.

Interested applicants are invited to submit a resumé and a statement of their educational philosophy and how they foresee contributing to the school's mission to:

Personnel Office  
N.C. School of Science and Mathematics  
P.O. Box 2418  
Durham, NC 27705

Deadline: January 31, 1989  
An Equal Opportunity Employer

### AUBURN UNIVERSITY

#### Division of Mathematics Department of Foundations Analysis, and Topology

One instructor position is expected for Fall '89 for the 9 mo. academic year; renewable appointment not to exceed 7 years. Duties include 15 hrs/wk teaching (3 courses). Anticipated salary is \$15,000-\$18,000. Master of Science degree in mathematics and record of teaching effectiveness required.

Send vita and have three letters of recommendation sent by February 15, 1989 to George Kozlowski, Head, Department of Foundations, Analysis, and Topology, Auburn University, AL 36849. Minorities and women are encouraged to apply.

AUBURN UNIVERSITY IS AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER.

### GREENSBORO COLLEGE

Position open August 1989 for a math generalist with potential to teach computer science to undergraduates. Ph.D. in Mathematics with dedication to teaching undergraduates in a small college setting required. Rank and salary commensurate with credentials and experience. Send letter of application, resumé, transcripts, and three letters of recommendation by December 16, 1988 to Professor Elizabeth Calog, Chair, Mathematics Search Committee, Greensboro College, 815 W. Market Street, Greensboro, NC 27401-1875.

### MATHEMATICS EDUCATION

Wright State University  
Department of Mathematics and Statistics  
Dayton, Ohio 45435

Tenure-track position in mathematics education anticipated for Fall 1989. Preference will be given to applicants who qualify for appointment at the rank of full professor but all qualified applicants will receive consideration. Excellent research record or

potential and commitment to quality teaching required. Applicants should expect to complete all requirements for the Ph.D. or Ed.D. by September 15, 1989. Competitive salary and excellent fringe benefits. Two-course teaching load. Department has 30 Ph.D. faculty and offers a masters degree. Please send vita, graduate transcript(s) and three letters of reference to: Faculty Search Committee. Closing date: February 1, 1989, then every two weeks until selection or July 1, 1989. WSU is an AA/EEOE.

### AGNES SCOTT COLLEGE

Department of Mathematics  
Decatur, Georgia 30030

Metro-Atlanta area liberal arts college with a strong four-year program in mathematics has a tenure-track position starting Fall 1989. With a firm and historical commitment to women's education, Agnes Scott has been successfully educating women for leadership roles for 100 years. The position requires a Ph.D. in mathematics or computer science, a strong commitment to teaching in an undergraduate setting, and a definite interest in participating in a growing program in computer science integrated within the mathematics curriculum. Salary and rank commensurate with qualifications. Professional activity is strongly encouraged. College support is available. Send resumé, transcripts, and 3 letters of recommendation to Robert Leslie, Chair. Complete files will formally be considered beginning January 23, 1989 and continue until the position is filled.

### MATHEMATICS DEPARTMENT

Kennesaw State College  
P.O. Box 444, Marietta, GA 30061

Two tenure-track positions in mathematics at the level of Assistant Professor or above beginning in September 1989. A Ph.D. is required with a strong commitment to undergraduate teaching as well as an interest in scholarly activities. Salary and rank are competitive and commensurate with credentials and experience. The College is located in Northwest Metro Atlanta, and enrolls approximately 8500 day and evening students in undergraduate and graduate programs. The Department of Mathematics has 15 full-time faculty and shares 6 others with the Department of Computer Science. Send resumé and a list of three references to Dr. Thomas R. Thomson, Chair, Search Committee. Application deadline is March 15, 1989 or until filled.

Kennesaw State College is an Affirmative Action/Equal Opportunity Employer.

### DARTMOUTH COLLEGE

John Wesley Young  
Research Instructorship

The John Wesley Young Research Instructorship is a two year post-doctoral appointment for promising new or recent Ph.D.'s 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 \$29,500 supplemented by summer (resident) research stipend of \$6555 (two-ninths). 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 Kenneth P. Bogart, Recruiting Committee Chair, Department of Math and CS, Bradley Hall, Hanover, NH 03755. Applications received by Jan. 10 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.

### FACULTY POSITION

Clayton State College

Clayton State College in the Atlanta area invites applications for a tenure-track position in mathematics for September 1989. Rank and salary depend on qualifications. Doctorate in mathematics or mathematics education preferred; Master's degree and teaching experience required. Apply by Feb. 6, 1989, to Catherine Aust, School of Arts and Sciences, Clayton State College, Morrow, GA 30260. AA/EEOI.

### THE AMERICAN UNIVERSITY

Washington, D.C. 20016

Tenure-track position available at the rank of Assistant Professor beginning Fall 1989 in the Department of Mathematics and Statistics. Qualifications: A Ph.D. in Mathematics Education or equivalent; evidence of teaching and scholarship. Responsibilities: Graduate and undergraduate teaching, advising, curriculum and program development, scholarship, and University service. Salary competitive, commensurate with qualifications and experience. Send curriculum vitae and three letters of recommendation to Basil P. Korin, Chair, Department of Mathematics and Statistics, the American University, Washington, D.C. 20016. An EEO/AA University; minority and women candidates encouraged to apply.

### FURMAN UNIVERSITY

Greenville, South Carolina 29613

One tenure-track position in mathematics beginning September 1989. A Ph.D. in mathematical sciences is required. Excellence in teaching and continued scholarly activity are expected. Rank and salary will be based on qualifications. All areas of specialization are acceptable. Vita, graduate and undergraduate transcripts, and three letters of recommendation should be sent to Dr. Robert Fray, Department of Mathematics. Application deadline: February 1, 1989. EOE/AEE.

### KENYON COLLEGE

Mathematics Department  
Gambier, OH 43022

Two tenure-track positions starting 89-90. One Asst. Prof. or beginning Assoc. Prof., other Asst. Prof. Ph.D. required for Assoc., highly desirable Asst. Must have broad background in math. For one position, preference for candidates in stats or prob. Strong commitment to undergraduate teaching and scholarship is required. Teach 3 courses per sem. For full information, contact Stephen Slack at the above address or call (614) 427-5267. First screening of dossiers December 15, 1988; applications accepted until positions are filled. Kenyon is an EOE and encourages applications from minorities and women.

### ITHACA COLLEGE

Department of Mathematics  
and Computer Science

The Department of Mathematics and Computer Science has several tenure eligible positions in Mathematics for Fall 1989. A Ph.D. in Mathematics or

Statistics is required. For one of these positions preference will be given to a person with the ability to teach statistics courses at several levels. Send vita to Dr. Diane Schwartz, Chair, Department of Mathematics and Computer Science, Ithaca College, Ithaca, New York 14850. An EO/AA Employer.

### BLOOMSBURG UNIVERSITY

Department of Mathematics and Computer Science, Bloomsburg University, Bloomsburg, PA 17815 (717-389-4500) has one tenure-track position available (with another temporary anticipated). Ph.D. in math, Computer Science, or Statistics preferred. Master's required. Nine-month salary to \$41,588. Twelve-hour teaching load will include courses at all levels. Candidates with expertise in Mathematical Statistics will be given priority. Send application letter, vita, three letters of reference, and college transcripts to Department. Application deadline is March 1, 1989. Minorities, women, and other protected class members are encouraged to apply. Bloomsburg University is an AA/EEO.

### RUTGERS UNIVERSITY

Newark, New Jersey  
Assistant/Associate Professor

The Academic Foundations Department invites applications for a tenure-track position teaching developmental mathematics. Doctorate required. Preference given to those who have demonstrated excellence in teaching underprepared students from diverse ethnic backgrounds and who have a record of research and publication. Responsibilities include teaching computation and algebra, developing curriculum, training tutors, advising, serving on committees, and coordinating the Department's evening courses. By 15 February, send letter and vita to Chair, Academic Foundations Department, Conklin Hall, Rutgers University, Newark, NJ 07102. AA/EEO. Women and minorities encouraged to apply.

### THE UNIVERSITY OF PUERTO RICO AT MAYAGUEZ

The Department of Mathematics has a tenure-track opening for an Instructor in the area of Statistics or Operations Research with a salary of \$17,400 per year. An M.S. degree in Mathematics, Statistics, or Operations Research and fluency in spoken and written Spanish and English are required. Send resumé and three letters of recommendation to: Dr. Rafael Martínez Planell, Chairperson, Department of Mathematics, UPR, P.O. Box 5000, Mayaguez, Puerto Rico 00709-5000.

### GRAND VALLEY STATE UNIVERSITY Allendale, Michigan

Tenure-track positions in Mathematics and Computer Science:

**MATHEMATICS:** Assistant—must have a Ph.D. with an emphasis in statistics, discrete mathematics, or mathematics education. Preference given to candidates with strong teaching recommendations.

**COMPUTER SCIENCE:** Assistant or Associate Professor—must have a Ph.D. in CS or Information Systems. Preference given to candidates qualified to assist in a C.I.S. graduate program.

For each position, duties include teaching, curriculum development, professional development, and student advising. GVSU is located just west of Grand Rapids, the second largest metropolitan area

in Michigan and offers numerous cultural and recreational opportunities. Cost of living is moderate and quality of life is high. Salary: commensurate with experience; good fringe benefits. Send resumé to: Faculty Search Committee, Math & CS Dept., GVSU, Allendale, MI 49401. An EO/AA Institution.

### MATHEMATICS

The Mathematics Department of the Southern College of Technology seeks applicants for one or (possibly) more tenure-track positions at the rank of Assistant or Associate Professor. The Department specifically desires faculty who can contribute to upper division programs in Mathematics. Ph.D. in mathematics or mathematical statistics required. Research potential is desirable but is neither required nor heavily weighed.

The ideal candidate will be able to demonstrate a strong mastery of the discipline, a commitment to professional growth and development, and ability for and commitment to excellence in teaching, and the potential and desire to enhance the college's intellectual community.

Southern College of Technology is a four-year unit of the University System of Georgia with an enrollment of about 3,800. The college is located in Marietta, GA, part of metropolitan Atlanta. Both the urban amenities of Atlanta and open countryside are accessible with relative ease.

The Mathematics Department has thirteen tenure-track faculty members of whom seven hold the Ph.D. in Mathematics. There is a minor in mathematics as well as a substantial load of service courses.

A complete application consists of a letter of application, a curriculum vitae, transcripts of all college work, and a minimum of two letters of reference. The search will continue until the position is filled, but applications received by February 15 will be considered first.

Applications and inquiries should be addressed to:

Dr. H.R. Andrews, Chair  
Mathematics Search Committee  
Mathematics Department  
Southern College of Technology  
Marietta, Georgia 30060

Southern College of Technology is an Equal Opportunity/Affirmative Action Employer.

### UNIVERSITY OF NORTHERN COLORADO

Assistant Professor of Mathematics and Applied Statistics. Possible tenure-track position beginning Fall 1989. Duties: teach a variety of undergraduate and graduate courses, advising, research, and university service. Teaching experience and research potential required. Citizenship or permanent visa required. Application deadline is March 20, 1989—a letter of application stating position number 20251, graduate transcripts, vita, three letters of recommendation, and names, addresses, and phone numbers of three references to Dr. Joan Richardson, Chair, Search and Screen Committee, Department of Mathematics and Applied Statistics, University of Northern Colorado, Greeley, CO 80639. UNC is an AA/EEO Employer.

### SOUTHWESTERN UNIVERSITY

Georgetown, Texas 78626

Applications are being invited for a tenure-track position in Mathematics at the Assistant Professor level beginning Fall semester 1989. Ph.D. required.

Southwestern is a selective liberal arts undergraduate college with 1100 students. Faculty are expected to have a strong commitment to excellence in undergraduate teaching, to maintain an active interest in scholarly pursuits, and to possess an appreciation of liberal arts education. Please send a letter of application, vita, and three current letters of reference to Theodore D. Lucas, Associate Provost. Southwestern University is an EOE/AA Employer.

# R · I · T

Rochester Institute of Technology's  
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Announces A New

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**July 10-29:** Fundamentals of Statistics I, Statistical Quality Control I, Design of Experiments I & Statistical Computing  
**July 31-Aug. 19:** Managerial Decision Making, Design of Experiments II, Statistical Quality Control II, Fundamentals of Statistics II

For more information, call Dr. Edward G. Schilling, Chairman, Graduate Statistics: (716) 475-6129 or write:



Rochester Institute of Technology

Center for Quality and Applied  
Statistics  
One Lomb Memorial Drive  
P.O. Box 9887  
Rochester, N.Y. 14623

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## Calendar

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### National MAA Meetings

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- January 17–20, 1990** 73rd Annual Meeting, Louisville, Kentucky  
**January 16–19, 1991** 74th Annual Meeting, San Francisco, California
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### Sectional MAA Meetings

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- Allegheny Mountain** Robert Morris College, Pittsburgh, Pennsylvania, March 31–April 1, 1989  
**Eastern Pennsylvania and Delaware** University of Pennsylvania, Philadelphia, Pennsylvania, April 8, 1989  
**Florida** University of Florida, Gainesville, Florida, March 3–4, 1989  
**Illinois** Western Illinois University, Macomb, Illinois, April 28–29, 1989  
**Indiana** Indiana University, Bloomington, Indiana, Spring, 1989  
**Intermountain** Brigham Young University, Provo, Utah, April, 1989  
**Iowa** Coe College, Cedar Rapids, Iowa, April 7–8, 1989  
**Kansas** Hutchinson Community College, Hutchinson, Kansas, April 21–22, 1989  
**Kentucky** Pennyrile Forest State Park, Dawson Springs, Kentucky, April 7–8, 1989  
**Louisiana–Mississippi** Mississippi State University, Biloxi, Mississippi, February 24–25, 1989  
**Metropolitan New York** SUNY at Farmingdale, Farmingdale, New York, May 6, 1989  
**Michigan** Hope College, Holland, Michigan, May 12–13, 1989  
**Missouri** University of Missouri–Columbia, Missouri, April 7–8, 1989  
**Nebraska** Doane College, Crete, Nebraska, April 14–15, 1989  
**New Jersey** St. Peter's College, Jersey City, New Jersey, April 22, 1989  
**North Central** Mankato State University, Mankato, Minnesota, April 7–8, 1989  
**Northeastern** Keene State College, Keene, New Hampshire, June 2–3, 1989; College of the Holy Cross, Worcester, Massachusetts, November 17–18, 1989  
**Northern California** Sonoma State University, Rohnert Park, California, March 4, 1989  
**Ohio** Ohio State University, Columbus, Ohio, Spring, 1989  
**Oklahoma–Arkansas** Central State University, Edmond, Oklahoma, March 31–April 1, 1989  
**Pacific Northwest** Gonzaga University, Spokane, Washington, June 15–17, 1989  
**Rocky Mountain** Fort Lewis College, Durango, Colorado, April 21–22, 1989  
**Seaway** Union College, Schenectady, New York, April 28–29, 1989; Utica College, Utica, New York, Fall, 1989; Colgate University, Hamilton, New York, Spring, 1990

- Southeastern** University of Tennessee, Knoxville, Tennessee, April 7–8, 1989  
**Southern California** California State University, Fullerton, California, March 4, 1989  
**Southwestern** Western New Mexico University, Silver City, New Mexico, April 21–22, 1989  
**Texas** Texas Lutheran College, Seguin, Texas, April 6–8, 1989  
**Wisconsin** University of Wisconsin–Parkside, Kenosha, Wisconsin, April 21–22, 1989
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### Other Meetings

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- February 20–24** Twentieth Southeastern International Conference on Combinatorics, Graph Theory, and Computing at Florida Atlantic University. Invited lecturers include: Professor Elwyn Berlekamp of the University of California, Berkeley, Professor Paul Erdős of the Hungarian Academy of Science, Dr. Ronald Graham of Bell Labs, Professor Marshall Hall, Jr. of Emory University, Professor László Lovász of Eötvös Lorand University, Professor Eugene Luks of the University of Oregon, Dr. William Mills of the Institute for Defense Analyses, and Professor Charles Sims of Rutgers University. In addition, there will be sessions for fifteen-minute presentations of contributed papers. Abstract deadline is February 3, 1989. For further information, contact: Frederick Hoffman, Department of Mathematics, Florida Atlantic University, Boca Raton, Florida 33431; (407) 367-3345 or 367-3340.  
**March 27–31** Alfred Tarski inaugural year lectures by Dana S. Scott. Three lectures evolved from Tarski's work. For further information, contact: Chairman, The Tarski Committee, Mathematics Department, University of California, Berkeley, California 94720.  
**March 30–April 1** The Department of Mathematical Sciences and the Institute for Computational Mathematics at Kent State University will host a conference on Approximation Theory and Numerical Linear Algebra at Kent State University, Kent, Ohio. The Conference will consist of 15 invited 1-hour addresses, 6 solicited 20-minute talks, and 8 contributed 15-minute papers. The Conference is international in nature, with 9 of the 21 participants coming from outside of the continental United States; it bears the endorsement of the International Mathematical Union. The conference proceedings will be published in *Numerische Mathematik*. For further information contact Professor E.C. Gartland, Jr., Department of Mathematical Sciences, Kent State University, Kent, Ohio 44242, USA; gartland@kent.edu or egartlan@kentvm.bitnet.  
**March 31–April 1** Pi Mu Epsilon Student Conference at St. John's University in Minnesota. Principle speaker will be Richard Askey of the University of Wisconsin, Madison. Conference open to all mathematicians and mathematics students, including non-members. For further information, contact: Jennifer Galovich (612) 363-3192 or Jim Wilmesmeier (612) 363-3092 both at St. John's University, College of Saint Benedict, Collegetown, Minnesota 56321.  
*(Calendar continued on page 12)*

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FOCUS

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JANUARY-FEBRUARY 1989

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