Restoring Scholarship to Collegiate Mathematics

Lynn Arthur Steen

The National Science Board, the policy council of the National Science Foundation, has undertaken a study of undergraduate science and engineering education to determine what initiatives, if any, would be suitable for future NSF programs. On November 20, former American Mathematical Society President Andrew Gleason and current MAA President Lynn Arthur Steen presented testimony about the needs of collegiate mathematics. What follows is a condensed version of Steen's presentation on behalf of the MAA.

I am very pleased that the National Science Board has undertaken a study of undergraduate education. As President of the Mathematical Association of America, I am especially pleased to have been invited to testify about collegiate mathematics. Most of our 20,000 members teach college mathematics, and most of the undergraduate mathe-

matics education in this nation is provided by members of our Association. We applaud your interest in collegiate mathematics and in its relation to science and engineering education.

I am a Professor of Mathematics at St. Olaf College in Northfield, Minnesota, one of the science-intensive liberal arts colleges referred to by Frederick Starr in his earlier testimony to this Committee. St. Olaf has 3,000 students;

MAA Committees Featured in Center Section

Starting with this issue, readers will find *FOCUS* bigger and better! Every issue will contain a center section featuring some aspect of the work and activities of the MAA.

The special "focus" in this issue is the MAA committees. Center sections in future issues will detail the MAA's accomplishments during the past year, the activities of the 29 MAA Sections, the MAA Publications Program, and the summer and winter national meeting programs. As a special one-time feature, the March-April issue will focus on the 1986 International Congress of Mathematicians to be held in August at the University of California at Berkeley.

Employment Ads

If you are looking for a job be sure to check the employment ads which start on page vi of the center section. Advertisers will find rates and deadlines on page vi. Note the 50% *discount* offered to advertisers in the March-April 1986 issue of *FOCUS*.

The Children's Television Workshop (CTW), creators of *Sesame Street*, *The Electric Company*, and *3-2-1 Contact*, has assembled $16 million—the largest sum ever raised for a single children's television project—and will begin production immediately on a new, daily mathematics series aimed at the nation's 14 million 8-to-12-year-olds. In the above sketch from the series, "Bandanas," Beverly Mickins plays a schoolmarm and Larry Cedar, a farmer, as they discuss how much fencing he will need for his newly-purchased land. For more information, see the article by Peter Hilton on page 3 of this issue.

Scholarship *(continued from page 1)*

about 10% of each year's graduates major in mathematics. The quality of our program, and of those at many leading liberal arts colleges, was strengthened during the last decade by former collegiate programs of the National Science Foundation. These NSF programs accomplished good things in their time, and I can say from first-hand experience that they helped enormously to strengthen the mathematics and science programs at my institution. Today, however, I intend to speak not about these programs or about liberal arts colleges, but about the needs of collegiate mathematics across the nation.

Collegiate Mathematics

As I'm sure you know, mathematics is both an enabling force and a critical filter for careers in science and engineering. NSF policy for science and engineering education—both precollegiate and collegiate—must be built on this central fact: mathematics is not just one of the sciences, but is *the* foundation for science and engineering.

Mathematics today is changing dramatically in content, in scope, and in application; it is not only being applied, but is being continually created. Whereas in the past only theoretical science required advanced mathematics, today all science-based fields use sophisticated mathematical models. These changes force fundamental rethinking of the mathematics curriculum. Yet because mathematics education is a continuous sequential process from primary school through graduate school, changes in any part have important consequences both for other parts of mathematics education and for subsequent courses in science and engineering.

The record suggests, however, that our mathematics faculties are increasingly unable to meet these important needs. Remedial, elementary and service courses drain faculty time and energy. Increased elementary enrollments combined with decreasing numbers of majors have simultaneously unbalanced the curriculum and depressed faculty morale. In too many departments, the result is a downward spiral of withdrawn faculty, uninspired teaching, and uninterested students.

Moreover, with few exceptions, mathematics faculty do not have access to appropriate computing resources. As a consequence, computing has had very little impact on the mathematics curriculum—neither on what should be taught nor on how it is taught. Computers are important tools for scientific and engineering modeling precisely because they enable effective applications of mathematics: what formerly existed only in theory now occurs in every laboratory right before our eyes. The computer revolution is just the visible tip of a much deeper revolution in applied mathematics. Undergraduate mathematics today must be conducted in active symbiosis with powerful computers—for symbolic manipulation, for graphical display, for numerical analysis, and for simulation.

Equally demanding and even more neglected are the challenges of providing mathematical courses appropriate for liberal education. For students in the arts and humanities, mathematics is an invisible culture—feared, avoided, and consequently misunderstood. Too often such students are forced to retake high school courses whose only purpose is to master skills that now can be performed far better by a computer. Illiteracy in mathematics breeds illiteracy in science and technology, driving deeper the wedge that separates the two cultures. In a society dominated by complex systems we need to do far more than we now do to convey to our society's future leaders—our present students—that mathematics is not magic, and that even those without advanced technical training need to know how to ask appropriate questions and demand responsible answers.

Left behind by the dramatic impact of computing and cut off by lack of time for professional development from the rapidly advancing frontiers of their own discipline, the mathematics faculties preside over a curriculum that is predominately elementary or out of date. Although this portrait is not typical of research universities and selective liberal arts colleges, it is, I believe, a fair assessment of collegiate mathematics at most of the nation's two- and four-year institutions where the vast majority of our students are educated.

Mobilization for Mathematics

The urgency of the need for revitalization of undergraduate mathematics is underscored by manpower needs: there is a serious and continuing shortage of school teachers in mathematics, sure to get worse since both the school age population and school teacher retirements will rise rapidly in the

Math on Television

Peter Hilton

It is exciting news that the Children's Television Workshop, creators of **Sesame Street**, **The Electric Company**, and **3-2-1 Contact**, is now engaged in devising a new daily mathematics series, to consist of 75 half-hour programs, scheduled to start in January 1987. The programs will be aimed at the 8-to-12-year-old age group. No official title has yet been given to the series, which is known to those working on it simply as "The Math Show." Extensive funding has already been assured through the support of the National Science Foundation, the U.S. Department of Education, the Corporation for Public Broadcasting, the Andrew W. Mellon Foundation, the Carnegie Corporation of New York, and IBM, the only corporate underwriter.

There are, of course, enormous possibilities in this venture. There is the chance to reach millions of American school children (and their parents), and to have a wonderfully positive effect on their mathematical understanding and their appreciation of the importance and interest of mathematics. There are very solid grounds for optimism that the opportunity will be grasped. The staff of the Workshop constitutes a highly skilled group of professionals possessed of the one great virtue essential to the expert: they know what they know and what they don't know. Thus they have assembled an advisory board of mathematicians, mathematics educators, teachers and mathematically literate persons who are very much involved in determining the curriculum and the pedagogical strategies to be adopted.

At the forefront of the thinking of all those involved in the enterprise are the following considerations. First, the programs must be designed to complement the instruction children receive in school and to provide reinforcement for the efforts of teachers. Second, the main purpose is to increase young people's interest in and enthusiasm for mathematics; any improvement of their arithmetical skills would be expected to come about as a result of their changed or enhanced attitude. Third, there should be a strong emphasis on problem-solving in the programs, but this is to be understood in the broad sense of learning how to ask the right questions as well as developing strategies for trying to answer them.

The plan is to base the format of the programs on parodied versions of television programs familiar to children. Music, electronic effects and animation will be used extensively. We can surely trust those people who did such a superb technical job with their other television series to produce something attractive and engaging to children. A repertory company of actors will perform skits that parody game shows, situation comedies, weather forecasts, sports commentaries, soap operas, and station breaks—and we cannot seriously doubt that most children will love them. We have grounds, however, for hoping for much more, namely, that these programs will mark a real breakthrough in the urgent and crucial problem of building a mathematically literate society in this country.

Five test programs will be produced during the next few months and the production of the 75-program series, designed to be viewed at home or at school, will begin early next year. Teachers will be able to record the program off the air for showing in the classroom at convenient times. Advance notice of the programs will be available to teachers to enable them to take maximum advantage.

Peter Hilton is a Professor of Mathematics at the State University of New York at Binghamton.

College Board Releases Series of Books on Preparation for College

The College Board has released a series of six books offering high school teachers suggestions on how to help students acquire the knowledge and skills they need to perform successfully in college. These books, one of which is on mathematics, are the latest development in the College Board's Educational Equality project, a ten-year effort begun in 1980 to strengthen the academic quality of secondary education and to ensure equality of opportunity for higher education for all students. They were written as a follow-up to the 1983 publication, *Academic Preparation for College: What Students Need to Know and Be Able to Do* (known as the "Green Book") which has been influential in curriculum development at state and local levels.

Academic Preparation in Mathematics gives special attention to the question of how students who are sidetracked from the usual sequence of college preparatory mathematics courses might still "catch up" with the learning needed for college. Of particular importance is the inclusion of statistics and the integration of computers and hand-held calculators into the mathematical curriculum.

For information on how to order individual copies or the complete set of six books (English, the arts, mathematics, science, social studies, and foreign language), write to: The College Board, EQ Achieving Books, 45 Columbus Avenue, New York, NY 10023-6917.

WASHINGTON OUTLOOK...
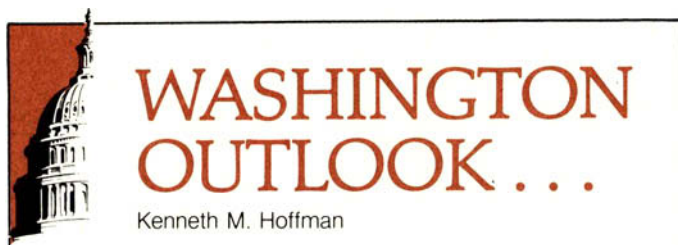
Kenneth M. Hoffman

NSB Ponders NSF's Collegiate Role

The National Science Board (NSB), the 24-member policy-making body for the National Science Foundation (NSF), has focused part of its attention in 1985 on the question of the appropriate role for NSF in collegiate mathematics, science, and engineering education.

Since 1982-83, when the Reagan administration, with a push from Congress, re-instituted the NSF Science and Engineering Education Directorate, this question has often been voiced in a very explicit form: does it make sense that NSF should have a $50 million precollege effort to complement its $26 million graduate fellowship/young investigator program, yet have but one $5 million instrumentation program at the undergraduate level?

The question hits home very hard in mathematics, where the collegiate effort is so large and is such a vital part of science and engineering education in general. The importance for our field and for the nation of several major opportunities (and a few problems) in collegiate mathematics was spelled out vividly on November 20, 1985, when Lynn Steen, MAA President, and Andrew Gleason, former American Mathematical Society (AMS) President, appeared before the NSB Task Committee charged with examining the gap which now exists at NSF between its graduate and precollege efforts. (See "Restoring Scholarship to Collegiate Mathematics" on page 1 of this issue.)

The committee, chaired by Homer Neal, Provost at SUNY Stony Brook, plans to report to the NSB at the Board's January meeting. What can our community expect to see come out of its deliberations?

- We can be sure the group will point out that the appealingly simple answer to the question, "Should NSF be in the collegiate education business?", namely, that of course NSF should, because education is a continuum, the collegiate level is critically important, etc., is not an answer at all, because it dodges the tough questions regarding, (i) an appropriate Federal role; (ii) within that, an appropriate, specific, and necessary NSF role.

We can speculate that the committee will point out that some of the issues go beyond what one broadly-based group can disentangle on a time scale of months, and suggest that further analysis is required.

We can hope that it will note that one major reason for the complexity is the discipline-dependence of the issues, and take special note that mathematics education, which is central to science and engineering education, needs particularly careful attention and represents a high-leverage area for NSF action.

The last hope is more than a fond wish, not only because witnesses from the mathematical community have pointed out the discipline-dependence and the centrality of mathematics education, but also because there is a growing awareness around Washington of the risks inherent in lumping diverse fields together in discussions of Federal planning at least where mathematics is concerned. This was one of the important points made by Representative Don Fuqua, Chairman of the House Committee on Science and Technology, in his October 29, 1985, remarks at the first meeting of the Mathematical Sciences Education Board of the National Research Council:

It seems to me that despite the fact that science and mathematics have areas of commonality, we need to be careful not to always think about them collectively. Not only are there differences and distinctions between them, but also, mathematics often becomes a step-child in that process. The science disciplines have always been much more equipment and laboratory focused, while historically mathematics has been more of a pencil-and-paper process. In this arrangement, the ways for improving science education have been more tangible; you build more modern labs and equip them with the newest tools and instruments. I think the need to improve and update mathematics education has seemed much less crucial or visible, and has frequently taken a back-seat to equipping science facilities.

If the NSB Committee on Undergraduate Education does recommend further study and analysis, a suitable approach to the analysis could position the Foundation to take advantage of recent and impending national overview efforts in mathematics education.

The National Research Council now has up and running, not only an advisory Board on Mathematical Sciences which emerged from the David Report process, but also the Mathematical Sciences Education Board, specifically established to provide advice and national leadership in mathematics education K-16.

The mathematical community of the country is in the final stages of developing a proposal to these two boards that they jointly undertake next year a major review of the national collegiate mathematics enterprise. The development effort, led by Bernard Madison of the University of Arkansas, is sponsored by MAA in conjunction with AMS and SIAM (Society for Industrial and Applied Mathematics), and supported by the Sloan Foundation. (See "Planning Underway for Study of Collegiate Mathematics Resources" on page 6 of this issue.) It will outline a review process to plan for the renewal of U.S. collegiate mathematics between now and the year 2000.

Such a plan can be expected to identify the roles which the review body feels that major constituencies might play in the renewal effort—government agencies, college administrations, professional mathematical organizations, etc.—based on a deep understanding of the field, its opportunities, and its needs.

This advice could be extremely valuable to the National Science Foundation and the National Science Board as well as our community, in what will presumably be an on-going effort to shape the NSF role in collegiate education.

Kenneth M. Hoffman is a Professor of Mathematics at the Massachusetts Institute of Technology and Executive Secretary for National Affairs of the Joint Policy Board for Mathematics.

FOCUS Center Sections to Feature MAA Activities

Starting with this issue, each issue of *FOCUS* will contain a center section featuring the people and programs of the MAA. This *FOCUS on MAA Committees* contains articles about the important work done by four MAA committees, each of which has broad responsibilities and a long tradition within the MAA. These committees represent only a small portion of the MAA committee structure, which includes over 75 committees and subcommittees with a total of more than 600 members.

The March-April 1986 *FOCUS* center section will feature the 1986 International Congress of Mathematicians, which will be held at the University of California—Berkeley, from Sunday, August 3 through Monday, August 11. (For additional information see page 5 of the news section of this issue.) The usual MAA Summer Meeting is not being held in order to give MAA members the opportunity to participate in the Congress. In future years, the March-April issue of *FOCUS* will contain the MAA Summer Meeting program.

The May-June issue will contain an annual report describing the status of the major activities of the MAA, and any important developments of the past year.

The September issue will feature a *FOCUS on MAA Sections*, reporting on the activities of the 29 MAA Sections.

The October *FOCUS* will contain the program for the MAA Annual Meeting.

The November-December issue will feature a *FOCUS on MAA Publications* and will bring readers inside stories about the people who write MAA books, edit its journals, or help in other ways to make the MAA a successful publisher in the field of mathematics. Book lovers should also watch this center section for information about up-coming books.

Employment Ads

To serve the needs of the mathematical community, each center section will also contain Employment Ads listing positions available in the mathematical sciences. Information about rates and how to submit an ad may be found on page vi of this issue.

CAMC Examines America

Stephen B. Maurer

Each year you read in *FOCUS* about the results in the USA and International Mathematical Olympiads (USAMO and IMO), and about the top scores in the earlier American exams which lead up to these. Responsibility for these American exams, taken by over 500,000 students yearly, and for United States preparation for the IMO, rests with the Committee on the American Mathematics Competitions (CAMC). The work of this committee involves over 120 people and a yearly budget of $350,000. Sponsored by 7 mathematics societies, the CAMC is administratively part of the MAA. It is one of the MAA's largest activities.

Structure and Activities

CAMC activity has three aspects: policy making, examination construction, and administration. Policy is the concern of the CAMC itself. Examination construction is delegated to subcommittees, aided by an Advisory Panel. Administration is handled by the office of the CAMC Executive Director, Professor Walter E. Mientka, in Lincoln, Nebraska, and some 80 Regional Examination Coordinators. In what follows, we elaborate this structure.

Members of CAMC hard at work at the Toronto meetings in August 1982. From left to right: Stanley Rabinowitz, Stephen Maurer, Michael Ecker, Richard Pieters, Nura Turner, and Melvin Woodard.

CAMC *(continued from page i)*

The CAMC itself has 12 members: 1 or 2 representatives from each sponsor, the Chairman and the Executive Director, and the Chairmen of the subcommittees. The sort of policy issues which must be considered range from big ones—shall we undertake a junior high exam (Yes!)—to small ones which nonetheless set a tone to the work— should partially sighted students be allowed to use reading machines, and should they be given extra time?

As for subcommittees, there is one for each exam: the American Junior High School Mathematics Examination (AJHSME), chaired by Thomas R. Butts of the University of Texas-Dallas, the American High School Mathematics Examination (AHSME), chaired by this author, the American Invitational Mathematics Examination (AIME), chaired by George Berzsenyi of Lamar University, and the USA Mathematical Olympiad (USAMO), chaired by Ian Richards of the University of Minnesota. Each subcommittee has 8 to 10 members.

The primary responsibility of each subcommittee is to produce the examinations. This is easier said than done. Examination problems must be fresh, interesting, instructive, at varying levels of difficulty from moderate to extremely hard, and completely unambiguous. Furthermore, solutions are produced which are meant to instruct in problem-solving techniques and illustrate good writing style. All of this means that many problems and solutions must be collected and repeatedly critiqued by people with both creative and editorial talents. To accomplish this, most of the exams are two years in the making and require many hours of each subcommittee member's time each year.

Subcommittees consider policy, too—how hard its exam should be, what awards should be given, etc. While the CAMC has final say on such matters, obviously these issues cannot be separated from examination construction. In the case of the USAMO, the Subcommittee has many such issues to consider, and a sub-subcommittee writes the examination.

The Advisory Panel, consisting of 10 to 15 people, has several purposes. First, it provides more input on problems. (Panel members contribute by mail, while subcommittee members work by mail and through meetings at national MAA conventions.) Second, since the talents and commitment needed for CAMC work are unusual and hard to evaluate except through experience, the Panel is used as a trial ground. As openings arise, people who have expressed an interest in CAMC work, or who have been identified through the Sponsors, are appointed to the panel on a yearly basis. In time those who do very well are appointed to the CAMC or a subcommittee. As with other MAA committees, terms are for 3 years, with one renewal common.

Finally, in addition to the subcommittees the CAMC has 3 special posts: Director and Assistant Director of the Training Session for the IMO, and Editor of our problem-solving journal, the *Arbelos*.

Administration

The Executive Director, with the help of an administrative aide, one-and-one-half secretaries, part-time help and (recently) a VAX 11/750, carries out a vast number of duties. Just answering correspondence, from a great number of people around the world, is a major job. This year, we have taken a major step towards centralization: the AJHSME, first given on December 10, 1985, will be our first large-enrollment exam to be scored centrally. Formulating the procedures for

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Invitation to Participation

All of the committees featured here, and all other MAA committees welcome input from MAA members and others on matters within their charge. Individuals who wish to express their opinions, bring information to the attention of a committee, or otherwise assist a committee in its work, are invited to contact any member of the committee.

Most MAA committees meet at one or both of the national meetings, and many of these meetings are open to any MAA member who wishes to attend. For information about committee meetings, contact the committee chair.

Interested in Serving on an MAA Committee?

The Officers of the MAA are always looking for people with the special talents needed by committees. Interested individuals should write to the MAA Secretary indicating their particular areas of interest and providing information about their background. Write to: Professor Kenneth A. Ross, Department of Mathematics, University of Oregon, Eugene, OR 97403.

CUPM Tackles Issues in Undergraduate Curriculum

Jerome A. Goldstein

During the 1950's and 1960's, the Committee on the Undergraduate Program in Mathematics (CUPM) was a major activity of the MAA supported by a seccession of NSF grants. Then, after a period of relative inactivity, CUPM was revitalized with a very intense meeting in Berkeley, California, in the summer of 1976. Three CUPM panels were created at this meeting. In the early 1980's these panels published reports concerned with a mathematical sciences major, mathematics appreciation courses, and minimal competence in mathematics for college graduates.

In recent years, several new CUPM panels have been created. Some remain as subcommittees of CUPM while others have been transformed into independent MAA activities.

Subcommittee on the Continuing Mathematical Education of Teachers. The Teacher Training Panel published its final report several years ago. The Panel was replaced by COMET, the Subcommittee on the Continuing Mathematical Education of Teachers. COMET has been extremely energetic and influential. A report on its activities by Bruce E. Meserve and Calvin T. Long appears elsewhere in this center section. COMET will break off from CUPM and become a standing committee of the MAA in January 1986.

Subcommittee on Calculus Articulation. This subcommittee, which consists of four high school teachers and three college teachers and is chaired by Donald B. Small of Colby College, has studied the nature of and problems associated with calculus in the secondary schools. It has just completed a draft of its final report.

Subcommittee on the Curriculum at Two-Year Colleges. This subcommittee, which is chaired by Ronald Davis of Northern Virginia Community College, is jointly sponsored by the Committee on Two-Year Colleges and the American Mathematical Association of Two-Year Colleges. It is heading towards a series of recommendations on all aspects of the mathematics curriculum at two-year colleges.

Subcommittee on Computers in the Classroom. Created jointly by CUPM and CCIME (Committee on Computers in Mathematics Education), this subcommittee has studied curricular aspects of computers in the classroom. It is chaired by L. Carl Leinbach of Gettysburg College. A parallel subcommittee was created by CTUM (Committee on the Teaching of Undergraduate Mathematics) and CCIME to study the teaching aspects of computers in the classroom. The work of these two subcommittees has progressed to a point where it seems prudent for them to merge with CCIME for form a single unified committee on computers. This merger takes place officially in January 1986.

Subcommittee on Service Courses. This subcommittee is jointly sponsored with the Committee on the Teaching of Undergraduate Mathematics (CTUM), and is chaired by Donald W. Bushaw of Washington State University. It has produced documents on mathematics appropriate for engineering students, and has been and continues to consider the mathematical needs in biology, chemistry, business, architecture, the health sciences, and other disciplines.

Subcommittee on Remediation. This subcommittee, which is chaired by Gloria Gilmer of Coppin State College, was formed to assess the problems of remediation on collegiate campuses, and recommend means of both getting at the root causes of the problems and pointing to effective remediation techniques. Currently under consideration is formation of a joint task force of the MAA, the American Mathematical Association of Two-Year Colleges, and the National Council of Teachers of Mathematics to continue and expand the work of this subcommittee.

Committee on Discrete Mathematics in the First Two Years. Finally, CUPM has worked closely with this well-publicized committee, which is funded by a grant from the Sloan Foundation and is chaired by Martha Siegel of Towson State University. It is progressing rapidly towards its final report.

Thus, CUPM has been busy lately. With some of its projects nearing completion, CUPM is beginning discussions of future projects and directions at its January 1986 meeting.

Jerome A. Goldstein is a Professor of Mathematics in the Department of Mathematics at Tulane University and is the Chairman of CUPM.

COMET Seeks to Improve Quality of Mathematics Teacher Education

Bruce E. Meserve and Calvin T. Long

The Committee on the Mathematical Education of Teachers (COMET) is a new committee—an outgrowth of the CUPM Panel on Teacher Training—created in recognition of the continuing mathematical needs of teachers at all levels throughout their professional careers.

The Teacher Training Panel is best known for its *Recommendations on the Mathematical Preparation of Teachers*

with editions published under various related titles in 1961, 1966, 1971, and in 1983 as *MAA Notes* Number 2.

Other activities of the Teacher Training Panel under the successive chairmanships of John Kemeny, Gail Young, Donald Kreider, and Bruce Meserve included contacts with state and national legislative leaders regarding bills related to teacher training, conferences on the training of teachers, published course guides, sponsored sections at meetings of the National Council of Teachers of Mathematics, and the preparation of position statements related to teacher training for the consideration of the MAA Board of Governors.

Under our co-chairmanship for the past two years, COMET has focused its attention on the preparation of a report *Guidelines for the Continuing Mathematical Education of Teachers.* This report is concerned with a variety of both inservice and degree programs. The present draft is being edited by Richard Guy. In the near future COMET expects to recommend publication in the *MAA Notes* series.

COMET has been identified by certain members of Congress as a source of information and advice on legislation affecting mathematics education. A little over a year ago we were contacted regarding the "Talented Teachers Act." This year we were asked by Representative Chandler of Washington to review the "Mid-career Math and Science Teacher Training Act." The bill as submitted made explicit use of COMET suggestions, especially those of Henry Alder.

COMET maintains active contact with other organizations concerned with teacher education—particularly the committees of the National Council of Teachers of Mathematics. Other recent or on-going activities include:

- A survey, by Mary Ann Norton, of teacher preparation and assignment practices;
- Sponsorship of a minicourse on Teacher Inservice Programs at the Eugene and Anaheim MAA meetings;
- Draft of a statement on Retraining of Teachers (see the March-April 1985 *FOCUS*);
- Draft of a statement on "College and University Responsibilities for Mathematics Teacher Education" (on the January 1986 agenda of the Board of Governors); and,
- Suggested responses to a variety of questions related to teacher education that have been addressed to the MAA.

Bruce E. Meserve, of Pleasant Hill, Tennessee, and Calvin T. Long, of Washington State University, are the Co-Chairs of COMET.

CTUM Helps Mathematicians Achieve High Standards in Teaching

Alan H. Schoenfeld

The Committee on the Teaching of Undergraduate Mathematics (CTUM) was formed in 1977 and made a standing committee of the MAA in 1979. CTUM and CUPM may be thought of as sister committees with joint responsibilities for the *how* and the *what* respectively of the undergraduate mathematics curriculum. In broadest terms, CTUM's charge is to help mathematicians achieve and maintain the highest standards of professionalism in their teaching.

From its inception, CTUM has focused on providing resource materials for mathematics instruction. Its first project produced an up-dated (1979) version of *College Mathematics: Suggestions on How to Teach It*, an informal guide to techniques for effective teaching. This was soon followed by the (1979) booklet *Training Programs for Teaching Assistants in Mathematics*, a guide to establishing low-cost Teaching Assistant (TA) training programs. In 1983, CTUM's Subcommittee on Problem Solving produced the first volume in the MAA Notes series, *Problem Solving in the Mathematics Curriculum*. This volume recommends the inclusion of problem-solving courses as regular offerings in the undergraduate mathematics curriculum. It offers a 50-page "how to" section for teaching problem-solving courses, and an 80-page annotated bibliography of problem-solving resources. All three of these manuals are available from the MAA.

At present CTUM has two joint subcommittees which work in areas of overlapping concern with other MAA committees: the Subcommittee on Service Courses, jointly sponsored with the Committee on the Undergraduate Program in Mathematics (CUPM); and the Subcommittee on Remediation, which is joint with CUPM and the Committee on Two-Year Colleges (CTYC). CTUM also has three (non-joint) subcommittees. In brief, these are as follows:

Subcommittee on Research. There is a growing body of literature about the learning and teaching of mathematics, and about what does and doesn't work in the classroom. The Subcommittee on Research, chaired by this author, is charged with the responsibility of combing the literature and bringing the relevant findings to the community's attention.

Thanks to a grant from the Sloan Foundation, two conferences on "Cognitive Science and Mathematics Education," which brought together mathematicians, mathematics educators, cognitive scientists, and classroom teachers, were held last year at Rochester. The idea for the conferences came, in part, out of the deliberations of the Subcommittee on Research. A volume of conference proceedings, summarizing useful findings and pointing to issues that need work, will be completed this year.

Subcommittee on the Evaluation of Teaching. The evaluation of teaching is an important and controversial issue, but one on which a fair amount of reliable research has been done. This subcommittee, which is chaired by Donald W. Bushaw of Washington State University, is nearing completion of a brief (about 20-page) report that will summarize the most important past findings on the evaluation of teaching, discuss their implications specifically for mathematics instruction, and make recommendations regarding the appropriate means and roles of teaching evaluations of mathematics faculty.

Subcommittee on Teaching Assistants and Part-Time Instructors. Enrollments in mathematics courses have increased over the past decade, while the number of regular mathematics faculty has decreased and the number of graduate students in mathematics has plummeted dramatically. In consequence, a large number of mathematics departments are supplementing their regular instruction with courses taught by adjunct faculty, by an increasing number of TA's for whom English is a second (and shaky) language, and by undergraduate teaching assistants. CTUM's earlier work on programs for TA's needs to be up-dated and expanded.

The subcommittee, which is chaired by Bettye Anne Case of Florida State University, is working to determine the appropriate standards for non-traditional instructors of mathematics courses, the appropriate structures within which they should be employed, and the appropriate training programs to guarantee that they are adequately prepared for their instructional assignments.

As noted above, CTUM's charge is to help mathematicians to achieve and maintain the highest standards of professionalism in their teaching. The major task facing CTUM over the next few years is to help determine those standards—what are legitimate expectations of faculty at various types of institutions?—to provide support materials to help faculty and departments achieve them, and to suggest appropriate means of evaluating teaching and programs.

Alan H. Schoenfeld is a Professor of Mathematics Education at the University of California at Berkeley and the Chairman of CTUM.

Steen Forms New MAA Committees

In response to changing needs for MAA activity, President Lynn Arthur Steen has established several new committees to explore issues of current concern. Many of these committees are *ad hoc* and will investigate possible future activities of the MAA. Some may become standing committees in the future if their tasks appear to have continuing benefit to the Association.

Howard Anton of Drexel University is chairing an *ad hoc* **Committee on Student Chapters** to explore means (clubs, chapters) by which MAA could attract undergraduate students to mathematics and to membership in MAA. Attracting students to careers in mathematics is one of the most important priorities of the Association; this committee will explore various options for accomplishing this, and will report to the Board of Governors with its recommendations.

David P. Rosselle of Virginia Polytechnic Institute is chairing an *ad hoc* **Committee on Accreditation** to explore whether MAA should undertake any special activity that would help establish standards for quality in undergraduate mathematics departments. Many department chairmen have been seeking assistance from the Association in strengthening their hands vis a vis other programs in their institutions. Accreditation is just one of several ways of doing this. The Committee will explore many possible ways of achieving these objectives, and will report its recommendations to the Board of Governors.

Bernard Madison of the University of Arkansas is chairing an *ad hoc* **Planning Committee for a National Study of Resources for Collegiate Mathematics.** The aim of this committee is to submit a proposal to the National Research Council for a major national study to be undertaken jointly by the Board on Mathematical Sciences (chaired by Michael Artin of MIT) and the Mathematical Sciences Education Board (chaired by Shirley A. Hill of the University of Missouri-Kansas City).

A standing **Committee on Membership** has been established under the chairmanship of Will Hahn of South Dakota School of Mines and Technology. Currently only about half of the persons teaching college and university mathematics are members of the Association. The charge to the Committee on membership is to work with the Washington staff and the officers to develop new approaches to recruiting and retaining members.

President Steen has also appointed several other committees for reasons of internal review of MAA activities, and may establish several joint committees with other mathematical societies. Among the latter are an NCTM/MAA committee to review college entrance requirements in mathematics, a proposed ACM/MAA committee on computer science education in college mathematics departments, a possible AMS/MAA/NCTM task force on remediation, and a possible CBMS/MAA/AMS committee on opportunities for handicapped individuals. Joint work with our sister societies is a high priority for the MAA, since the mathematical community is strengthened by every example of cooperative activity.

administering and grading the AJHSME, and getting the computer up and ready, has been the Executive Director's major activity for the past year.

Every year, the Executive Director manages the preparation of all brochures and manuals, the printing of all exams, and the mailing of these items plus orders for back exams and MAA problem books. He directs the computer scoring of the (lower participation) AIME, compiles the national results and awards for the AHSME, convenes a team of graders for the USAMO (essay questions), and extends invitations to the USAMO and IMO Training Session. He also does all the budgeting and accounting.

For the AHSME, which long predates modern computer power, much of the administration is decentralized. Each state has one or more Regional Examination Coordinators (REC), who invite schools to participate, handle the fees, compile results in the region (usually after the schools have scored their own papers), and make sure that students get the appropriate local awards. In some cases REC's have arranged for special awards and scholarships from businesses and colleges in their areas. Many are active in visiting schools and improving the quality of education. The 65 REC's in the U.S. and Canada are appointed by the Governors of their MAA Sections; there are 15 more overseas.

The administrative organization is not complete without mention of MAA Headquarters, West Point, and Annapolis. Arrangements for the elaborate USAMO Awards Ceremony each June, which is funded primarily by IBM, take a good deal of time at Headquarters in the late spring. The IMO Training Sessions, directed by Cecil C. Rousseau of Memphis State University and Gregg N. Patruno of Princeton University, would not be possible without grants from the Army and Navy and without the superb organization of staffs at the service academies, where the Training Sessions are held. Finally, some administration for all the exams is handled by the CAMC Chairman, notably personnel recommendations and investigations of questionable scores.

History

The American Mathematics Competitions have come a long way since 1950, when the AHSME began as a local examination of the Metropolitan New York MAA Section. Participation rapidly grew beyond New York, and in 1955 the national MAA agreed to provide sponsorship and administrative support. At the same time, the Society of Actuaries became the first co-sponsor. The next co-sponsor, Mu Alpha Theta, joined in 1965, and the second exam, the USAMO, commenced in 1972. Expansion has heen very rapid in the last few years. Sponsors now include ne MAA, the Society of Actuaries, Mu Alpha Theta, the National Council of Teachers of Mathematics, the Casualty Actuarial Society, the American Statistical Association, and the American Mathematical Association of Two-Year Colleges.

For more history, more details about how the CAMC operates, and information about the philosophy of the various exams, see Maurer & Mientka, "AHSME, AIME, USAMO: The Examinations of the Committee on High School Contests," *Mathematics Teacher,* 75 (October 1982) 548-557. (The article is out-of-date on the number of exams and the name of the committee.)

Stephen B. Maurer is a Professor of Mathematics at Swarthmore College and is the Chairman of CAMC.

Special Introductory Offer

FOCUS Initiates Employment Ad Column

With this issue, the Mathematical Association of America initiates *FOCUS* employment ads. This new feature is being offered as a service to MAA members and to the mathematical community.

The rates for *FOCUS* employment ads are:

- 50 words or less: $25
- More than 50 words: $30 per column inch.

There is a 15% discount for the same ad in 3 consecutive issues (with contract in advance). An insertion order on institutional letterhead will be considered a contract. Charges will be billed after the last occurrence specified in the contract.

As a special introductory offer, *employment ads placed in the March-April 1986 issue will be half-price.*

Anyone wishing to place an employment ad in *FOCUS* should write to: *FOCUS* Employment Ads, Mathematical Association of America, 1529 Eighteenth Street, N.W., Washington, D.C. 20036. Or, for more information, call the MAA Washington Office at (202)387-5200.

The deadline for *FOCUS* employment ads is the first of the month preceding the issue month (e.g., February 1 for the March-April issue).

DEPARTMENT OF MATHEMATICS
TEXAS A&M UNIVERSITY
The Department of Mathematics at Texas A&M University hopes to fill several positions at all ranks beginning the Fall semester, 1986. While applications are invited in all areas of mathematics, candidates in applied mathematics, partial differential equations or numerical analysis are particularly encouraged to apply. Please send curriculum vitae and have at least three letters of recommendation sent to Prof. H.E. Lacey, Head, Department of Mathematics, Texas A&M University, College Station, TX 77843. Texas A&M University is an equal opportunity/affirmative action employer.

The Department of Mathematics at Northern Arizona University in Flagstaff anticipates one or more tenure track positions at the Assistant Professor level, and one or more nontenure track positions at the Instructor level. Candidates for the Assistant Professor position should have a Ph.D. in Mathematics and a strong commitment to teaching and research. Candidates for the Instructor position should have a masters degree in Mathematics or Applied Mathematics and a commitment to teaching lower division undergraduate courses. The Instructor position will be one year appointments, with the prospect of reappointment on a year-to-year basis for a maximum total of three years. Send resume and three letters of recommendation to Dr. Peter Horn, Dept. of Math., Box 5717, N.A.U., Flagstaff, AZ 86011. Deadline for applications is Feb. 14 and monthly thereafter until positions have been filled. Starting date is Aug. 21, 1986. An Equal Opportunity/Affirmative Action Institution.

UNIVERSITY OF MINNESOTA
Mathematics Position
Tenure track mathematics position at assistant, associate or full professor level available September 16, 1986. Rank will depend on experience and qualifications. Ph.D. in mathematics, strong collegiate teaching experience and research required. Responsibilities include teaching undergraduate courses in math as well as appropriate research. Normal teaching load 8-10 hrs/wk.
Campus is located 150 miles west of Mpls-St. Paul at edge of MN's famous lake region. Position carries all responsibilities and privileges of a U of Minnesota faculty appointment. Sound retirement program, excellent fringes, small town atmosphere are among benefits. Salary competitive.
Send resume, transcripts, and at least 3 letters of recommendation by February 15, 1986 to: Dr. James Olson, Chr., Division of Science and Mathematics, Rm 217F, University of MN, Morris, MN 56267. The University of Minnesota is an equal opportunity educator and employer and specifically invites and encourages applications from women and minorities.

UNIVERSITY OF COLORADO, Mathematics Department Colorado Springs, CO 80933-7150 Applications are invited for two tenure-track positions in Statistics/Mathematics starting Fall 1986. Applicants should be strong in research and teaching. Salary and rank negotiable. Send Resume and 3 letters of recommendation by 15 February 1986 to K.M. Rangaswamy, Chairman. UCCS is an Equal Opportunity/Affirmative Action Employer.

Tenure Track Position—Begin September, 1986. Teach undergraduate courses. Doctorate preferred, minimum of Masters. Applications from all specialities are welcome. Ability to teach beginning and intermediate Computer Science courses desirable. Send resume, transcripts, and three letters of recommendation to Robert L. Holmen, Department of Mathematics and Computer Science, Minot State College, Minot, ND 58701.

IDAHO STATE UNIVERSITY, DEPARTMENT OF MATHEMATICS
POCATELLO, IDAHO 83209
Tenure-track assistant professorship to begin Fall 1986. To teach undergraduate and graduate mathematics courses including the usual service courses. Ph.D. or D.A. in mathematics is required. Qualifications include evidence of superior teaching and potential for continuing research. Persons with any research area are encouraged to apply. $20,000 minimum salary. Open until filled. Initial screening to begin February 1, 1986. Send letter or application vita, 3 letters of reference and transcripts to: Richard D. Hill, Department of Mathematics, Box 8085, Idaho State University, Pocatello, Idaho 83209.
Equal Opportunity/Affirmative Action Employer

COMPUTER SCIENCE POSITIONS
PACIFIC LUTHERAN UNIVERSITY
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
TACOMA, WA 98447
Two computer science positions on tenure track at assistant or associate professor level beginning September 1986. Teaching undergrad and masters level courses in computer science. Ph.D. in computer science or equivalent.
Facilities: VAX 780, VAX 750, PDP 11/23, Apple and IBM Micro Labs, Graphics Lab. Send Vita, transcripts of college work, and 3 letters of recommendation (one on teaching ability) to: Computer Science Search Committee; Larry Edison, Chair; Department of Mathematics and Computer Science; Pacific Lutheran University, Tacoma, WA 98447.

MATHEMATICS POSITION
PACIFIC LUTHERAN UNIVERSITY
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
TACOMA, WA 98447
Mathematics position at assistant professor level beginning September 1986. Ph.D. in Mathematics. Some background in computer science useful. Teaching undergrad courses at university with strong liberal arts program. Normal load is 6 courses per year. Eighteen faculty in dept., half in math. Send vita, transcripts of college work, and 3 letters (one on teaching ability) to Larry Edison, Math Search Committee, Department of Mathematics and Computer Science; Pacific Lutheran University, Tacoma, WA 98447.

UNIVERSITY OF WISCONSIN-EAU CLAIRE
Computer Science Faculty
The University of Wisconsin-Eau Claire is seeking candidates for tenure-track faculty position(s) in the Department of Computer Science for the 1986-87 academic year starting August 25, 1986. Responsibilities include teaching both introductory and advanced courses as well as providing academic advising to students.
Salaries are competitive and commensurate with qualifications and experience. University fringe benefits such as health and life insurance are also provided. Qualifications include a Ph.D. (Master's degree acceptable) in computer science with emphasis in system software or hardware organization and experience with high-level languages including Pascal. If you are interested in joining a teaching community that is committed to the achievement of excellence, please submit a letter of application, resume and three letters of recommendation to:
Dr. David A. Nuesse, Chairman
Department of Computer Science
University of Wisconsin-Eau Claire
Eau Claire, WI 54702
715-836-2526
University of Wisconsin-Eau Claire
An Equal Opportunity Employer

UNIVERSITY OF DELAWARE. At least 3 regular openings for 9/1/86. Seeking senior person in field of probability to support Operations Research Program. One position at assistant professor level in numerical applied mathematics. Ph.D. and strong research creden-

tials required for all positions. 6-7 hours/semester teaching load. Salary competitive. Send resume, 3 letters of reference and reprint/preprints to Dr. Ivar Stakgold, Chair, Dept. Mathematical Sciences, University of Delaware, Newark, DE 19716. Closing date February 1, 1986. University of Delaware is an equal opportunity employer which encourages applications from minority groups and women.

Opening in a tenure track position in mathematics and/or computer science for the fall 1986 at the Assistant Professor level. Applicants should have a Ph.D. in mathematics or computer science. The salary and fringe benefits are competitive with those of similar institutions. King's College is an independent four-year College founded by the Congregation of Holy Cross Fathers. Application deadline: January 15, 1986. Send applications, including resumes, letters of reference and transcripts to: Dr. D.W. Farmer, Academic Dean, King's College, Wilkes-Barre, PA 18711

WEST VIRGINIA UNIVERSITY
DEPT. OF MATHEMATICS
Applications are invited for an anticipated full professorship, Fall 1986. Candidates should hold a terminal degree in an applied area, have a record of funded research, and be able to provide leadership to our junior faculty in applied analysis. Send vita and arrange for at least three letters of recommendation to be sent to: Professor Alphonse H. Baartmans, Chair, Dept. of Mathematics, West Virginia University, Morgantown, WV 26506. For information regarding this position please write or call (304) 293-2011. Review of applications will begin Feb. 15, 1986 and continue until the position is filled. WVU is an AA/EO employer.

WEST VIRGINIA UNIVERSITY
DEPT. OF MATHEMATICS
Applications are invited for anticipated Assistant/Associate Professor tenure track positions, Fall 1986. A terminal degree is required, and a demonstrated commitment to research in numerical analysis or discrete mathematics and to teaching is expected. Preference will be given to applicants who can participate in the department's research program involving interdisciplinary ties. Send vita and arrange for at least three letters of recommendation to be sent to: Professor Alphonse Baartmans, Chair, Dept. of Mathematics, West Virginia University, Morgantown, WV 26506. For information regarding these positions please write or call (304) 293-2011. Review of applications will begin Feb. 15, 1986 and continue until the position is filled. WVU is an AA/EO employer.

University of Toledo
Department of Mathematics
Applications are invited for three or more tenure track positions and at least one visiting position, all at the Assistant Professor level, beginning in September 1986. Applicants should have a Ph.D. (or have completed the Ph.D. by the Fall of 1986) and be committed to both teaching and research. Please send a vita and arrange for three letters of reference to be sent to Harvey Wolff, Chairman, Department of Mathematics, University of Toledo, Toledo, Ohio 43606. The University of Toledo is an equal opportunity, affirmative action employer.

Mary Washington College
Mathematics Department
Tenure track position in mathematics beginning Fall, 86. Assist. Prof. or higher. Rank commensurate with qualifications and experience. Ph.D. preferred. Candidates should have a strong interest in teaching and developing professionally at a small, u-grad, state supported, liberal arts college. Teaching load is 12 hr/sem. Applicants should send resume, graduate transcript, and 3 letters of reference to arrive no later than Feb 15, 1986. Send to: J. Zeleznock, Search Committee Chairperson, Dept. of Math Science, Mary Washington College, Fredericksburg, VA 22401-5358.

HARVARD UNIVERSITY, DEPARTMENT OF STATISTICS
Assistant/Associate Professor, beginning September 1986. Ph.D. in Statistics or equivalent research record in Statistics. Responsibilities include undergraduate and graduate teaching and active participation in research efforts. Applications with CV and references to Professor Donald B. Rubin, Chairman, Science Center 609, 1 Oxford Street, Cambridge, Massachusetts 02138, USA. Harvard is an Equal Employment/Affirmative Action Employer.

WILKES COLLEGE
Faculty Position
The Department of Mathematics and Computer Science invites applications for a tenure-track position beginning fall, 1986. Ph.D. or ABD in computer science or a Ph.D. in mathematics and substantial interest in computing is required. Teaching responsibilities include a mix of undergraduate and graduate mathematics and undergraduate computer science, depending on the expertise of the candidate. Wilkes College has 1800 undergraduates, the department has 13 faculty members and 175 majors. Computing facilities include a Data General MV10000 (for academic use), an HP3000-6800 and about 80 microcomputers. Send resume and three letters of recommendation to Richard E. Sours, Chairman, Department of Mathematics and Computer Science, Wilkes College, Wilkes-Barre, PA 18766.

NORTH DAKOTA STATE UNIVERSITY
Fargo, North Dakota
One tenure track position expected for the academic year 1986-87. Rand and specialty area open. Ph.D. in mathematics and evidence of both teaching ability and research activity/potential are required. Salary commensurate with experience. Teaching load: 2 courses per quarter. Send vita and three letters of reference to:
    Search Committee
    Mathematical Sciences
    300 Minard, NDSU, Box 5075
    Fargo, ND 58105
Deadline: March 1, 1986 or until position is filled. NDSU is an Equal Opportunity Employer.

Regular faculty position in statistics, mathematics or computer science. Assistant professor level. Ability to teach in more than one discipline preferred. Emphasis on quality teaching, 12 credit hours/semester. Doctorate required. Beginning August 1986. Applications must be postmarked by February 3, 1986 to Thomas Kearns, Chairman of Mathematical Sciences, Northern Kentucky University, Highland Heights, Kentucky 41076. NKU is an Affirmative Action/Equal Opportunity Employer and actively seeks the candidacy of minorities and women.

COLLEGE OF ST. THOMAS
Tenure-track Assistant Professorship, beginning 9/86. Requirements include a Ph.D. degree, commitment to quality teaching, and a desire to make a positive contribution to a church-related liberal arts college. The College of St. Thomas, the largest private college in Minnesota, is ideally located one block from the Mississippi River in the heart of the dynamic Twin Cities metropolitan area. Applicants should send a letter of interest, C.V., transcripts and three letters of recommendation (including comments on teaching performance/potential) to Dr. John T. Kemper, Department of Mathematics, College of St. Thomas, St. Paul, MN 55105. Applications will be accepted until February 1, 1986, or until the position is filled.

MATHEMATICS: Southern Technical Institute anticipates the possibility of one or more tenure-track positions beginning September 1986. Ph.D. in Mathematics and a background in technology preferred. M.S. in Mathematics required. Southern Technical Institute offers degrees in Engineering Technology and is located in Marietta, GA, a suburb of Atlanta. Most teaching is in the lower division. Research not required. A complete application consists of an application letter, a complete resume, three letters of reference, and transcripts of all college work. Applications completed by 15 February 1986 will be considered first. Inquiries and applications should be addressed to Dr. H. Robert Andrews, Chairman, Mathematics Search Committee, Southern Technical Institute, 1112 Clay St., Marietta, GA 30060.

DENISON UNIVERSITY
Two tenurable positions in the Mathematical Sciences (Mathematics, Statistics, or Computer Science) for 1986-87 at a liberal arts institution. A Ph.D. in one of the mathematical sciences is required and a background in statistics or computer science is desirable but not essential. A strong commitment to quality instruction of undergraduates is essential. Denison University is a liberal arts college of 2,100 students located in a village of 4,000, seven miles from Newark (population 50,000) and twenty-five miles from Ohio State University. The Department of Mathematical Sciences offers B.A. and B.S. degrees in mathematics and computer science as well as a mathematics-economics joint B.A. degree. The department consists of 10 full-time and two part-time faculty members. Four members of the department have advanced degrees in computer science. The primary responsibilities of these positions are teaching and some research. The teaching load is three courses per semester with limited responsibilities during January Term. Denison does not have a summer session but does make financial support available for research. Please send resume and appropriate transcripts with your letter of application to Professor Zaven A. Karian, Chairman, Department of Mathematical Sciences, Denison University, Granville, Ohio 43023. Also ask three persons who know you well to send reference letters in support of your application.
Applications should be made by February 15, 1986.
Applications beyond this date will be considered until the position is filled. Denison is an Affirmative Action/Equal Opportunity Employer.

Department of Statistics, North Carolina State University
Assistant Professor Biomathematics Program. Research in applications of mathematics and statistics to the biological sciences.

Expertise in stochastic modeling preferred. Ph.D. in a mathematical science or biological science if sufficient mathematical ability. Resume, transcripts, 3 letters by January 31, 1986 to Biomathematics Search Committee, Department of Statistics, Box 8203 North Carolina State University, Raleigh, NC 27695-8203. AA/EOE.

Mathematics: Five tenure track positions available Fall, 1986. Ph.D preferred. Three tenure track positions available Fall, 1986. MS or MS +.
Salary and rank commensurate with training and experience.
Ph.D's teach four courses per semester, undergraduate and graduate. Extra consideration to applicants in statistics, algebra, and geometry. MS + faculty teach 5 courses per semester.
Send letter of application, resume, transcripts and three letters of recommendation to:
    Mathematics Search Committee
    Department of Mathematics and Computer Science
    Box 34
    Middle Tennessee State University
    Murfreesboro, TN 37132
Application review for Ph.D's began November 4, 1985. Application review for MS + begins January 4, 1986. Applications will be accepted until the positions are filled. Equal opportunity, affirmative action employer.

INDIANA UNIVERSITY AT SOUTH BEND, Dept. of Math. and Computer Science, Box 7111, South Bend, IN 46634. MATHEMATICS and COMPUTER SCIENCE. Applications are invited for five tenure-track appointments for 1986-87. Two asst. prof. in mathematics and 3 asst. or assoc. prof. in computer science. Teaching load, 9 hours, salary competitive. Math appointments require Ph.D. Computer Science appointments require Ph.D. in C.S. or master's level competence in C.S. and Ph.D. in related area. Applicants should forward curriculum vitae and arrange for 3 letters of recommendation to b e sent to L.R. Williams, Chairman. Applications will be reviewed beginning Jan. 1 and accepted until the positions are filled. Indiana University is an equal opportunity/affirmative action employer.

MATHEMATICS
UNIVERSITY OF MARYLAND BALTIMORE COUNTY
The UMBC Mathematics Department invites applications for tenure and tenure track faculty positions in applied Mathematics, beginning September 1, 1986. Candidates should have a Ph.D. and research and teaching experience commensurate with position applied for. Faculty with strengths in Control and Communication, Operations Research or Scientific computing and Modeling will be preferred. The department has a faculty of about 25 at present. Applications should be received at the earliest.
Send curriculum vitae, reprints and/or preprints, names of at least three referees, and a summary of current research activity to: Professor Nam P. Bhatia, Chairman Faculty Recruiting, Department of Mathematics, UMBC, Cantonsville, MD 21228. EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER. MINORITIES AND WOMEN ARE ENCOURAGED TO APPLY.

TOWSON STATE UNIVERSITY
BALTIMORE, MARYLAND 21204
Two tenure-track assistant professorships in Mathematics available Fall 86, contingent on state funding. Teach 12 hrs/semester of undergraduate courses. Qualifications: Ph.D., commitment to teaching and research, 3 years teaching/research experience preferred. Area of specialization open. For one position preference will be given to applicants with specializations in discrete math or applied statistics. Salary to $30,100. Send resume, 3 letters of recommendation and transcripts by Feb 1, 1986, to Dr. M.J. Siegel, Chairperson Search Committee, Math Dept., Towson State University, Baltimore MD 21204. An Equal Opportunity, Affirmative Action Employer.

MATH POSITIONS AVAILABLE
Opportunities for good teachers in mathematics. The Math department is seeking candidates for tenure track and possibly other positions. Ph.D. in Mathematics is expected. Rank and salary open, depending on qualifications.
Evidence of good teaching particularly for low level courses required for all positions. Other desirable credentials (required for any tenure-track positions) include willingness to teach computer science and research promise in area compatible with departmental interests. (Theoretical Computer Science, Geometry, Group Theory, Topos Theory and related areas.) Expertise in computer science is welcome. Please send resume and letters of recommendation to:
    John Kennison, Chair
    Math/CS Department
    Clark University
    Worcester, MA 01610
Applications will be accepted until January 20, 1986 or until the positions are filled.
Clark is an equal opportunity, affirmative action employer and welcomes applications from women and members of minority groups.

TENURE TRACK
The Department of Mathematics has a tenure track position(s) at the Assistant or Associate Professor level for Fall, 1986. Outstanding teaching qualifications and an interest in continued research are required; a Ph.D. in mathematics is necessary. Rank and salary will be determined by the experience and qualifications of the candidates. Send vita and three letters of reference by February 14 to the Chair of the Selection Committee, Department of Mathematics, California State University, Fullerton, CA 92634.
AA/EEO/Title IX Employer.

LECTURESHIP POSITIONS
The Department of Mathematics anticipates lectureship positions for 1986-1987. Evidence of outstanding performance in teaching and a Ph.D. in mathematics are required. Rank and salary will be determined by the experience and qualifications of the candidate. Send vita, three letters of reference and a list (or transcript) of coursework to the Chair of the Selection Committee by March 3, 1986. Department of Mathematics, California State University, Fullerton, CA 92634.
AA/EEO/Title IX Employer

TENURE TRACK
The Department of Mathematics has a tenure track position in applied mathematics for Fall, 1986. Applicant's background should be in an applied area such as Control Theory, Numerical Analysis, Optimization, Modeling or Applied Probability Theory. A major component of this position is the acquisition, development, and supervision of projects from the local industrial community in support of our applied master's degree program. Previous industrial experience is desired. Outstanding teaching qualifications and an interest in continued research are required; a Ph.D. in mathematics is necessary. Rank and salary will be determined by the experience and qualification of the candidate. Send vita and three letters of reference by February 14 to the Chair of the Selection Committee, Department of Mathematics, California State University, Fullerton, CA 92634.
AA/EEO/Title IX Employer

Department of Statistics,
North Carolina State University
Tenure-track position as Assistant Professor of Statistics beginning July 1, 1986. Strong research ability and interest in applications. Resume, transcripts, 3 letters of reference by January 31, 1986 to Statistics Search Committee, Department of Statistics, Box 8203, North Carolina State University, Raleigh, NC 27695-8203. AA/EOE.

Yeshiva University: Several tenure-track positions in Mathematics and/or Computer Science. Earned doctorate, demonstrated research potential and strong commitment to undergraduate teaching required. Resume and three letters of reference to Dean Norman S. Rosenfeld, Yeshiva College, 500 W. 185th St., New York, NY 10033. EO Employer

Head, Department of Mathematics
Northeast Louisiana University
Tenure-track appointment beginning July 1, 1986. Faculty of 25 members, offering the Bachelor of Science degree in Mathematics. Rank and salary open. Qualifications are a Ph.D. in mathematics, evidence of scholarly activity, and experience in teaching and conducting research. Candidates should have a minimum of 5 years of full-time university level teaching and some administrative experience. Equal opportunity/affirmative action employer. Application deadline: April 1, 1986. Apply to:
    Dr. Daniel E. Dupree, Dean
    College of Pure and Applied Sciences
    Northeast Louisiana University
    Monroe, LA 71209

Computer Science: Tenure track position beginning August 1986. Appalachian State University is a member of the University of North Carolina system; located in the Blue Ridge Mountains of western North Carolina in the heart of the southern ski area; has enrollment of 10,000; the Department of Mathematical Sciences is housed in the College of Arts and Sciences; department includes Mathematics, Computer Sciences, Statistics, Applied Mathematics and Mathematics Education; approximately 350 majors; strong master's degree program; micro labs, mini labs, and labs with mainframe terminals are maintained within the department; well equipped faculty work stations; primary emphasis on teaching but research is encouraged; teaching load 9-12 semester hours; Ph.D. in Computer Science or in a Mathematical Science with expertise in computer science is preferred. Commitment to teaching mandatory. Rank and Salary will be based upon qualifications and experience. To apply, send letter of application, resume, graduate transcripts, and three current letters of recommendation to: H.W. Paul, Mathematical Sciences, Appalachian State University, Boone, North Carolina 28608. Completed application must be received by February 24, 1986. An Equal Opportunity Employer.

Mathematics: Hillsdale College an independent, coeducational, liberal arts college of 1,000 students, seeks a mathematician for a tenure track appointment to begin August, 1986. A candidate should hold the Ph.D. in mathematics, and should expect to teach all levels of undergraduate mathematics. Salary and rank will be competitive and commensurate with qualifications. Please send vita and three letters of reference by January 31, 1986 to Prof. Mark Watson, Chairman, Department of Mathematics, Hillsdale College, Hillsdale, Michigan 49242. An equal opportunity employer.

Mathematical Sciences: Tenure track position beginning August 1986. Appalachian State University is a member of the University of North Carolina system; located in the Blue Ridge Mountains of western North Carolina in the heart of the southern ski area; has enrollment of 10,000; the Department of Mathematical Sciences is housed in the College of Arts and Sciences; department includes Mathematics, Computer Sciences, Statistics, Applied Mathematics and Mathematics Education; approximately 350 majors; strong master's degree program; micro labs, mini labs, and labs with mainframe terminals are maintained within the department; well equipped faculty work stations; primary emphasis on teaching but research is encouraged; teaching load 9-12 semester hours; Ph.D. in a mathematical Science is preferred. Commitment to teaching mandatory. Teaching assignments to include courses at the general undergraduate and/or graduate levels. Suggested Rank: Assistant Professor, but rank and salary will be based upon qualifications and experience. To apply, send letter of application, resume, graduate transcripts, and three current letters of recommendation to: H.W. Paul, Mathematical Sciences, Appalachian State University, Boone, North Carolina 28608. Completed application must be received by March 25, 1986. An Equal Opportunity Employer.

UNIVERSITY OF CINCINNATI, DEPT. OF MATH. SCIENCES
MAIL LOCATION #25, CINCINNATI, OH 45221
The University of Cincinnati expects to make several tenure-track appointments at the assistant professor level. Preference will be given to candidates with potential to strengthen the existing research areas in the Department. All candidates must have outstanding potential for research, scholarship, and teaching. Send vita and direct 3 letters of reference to C.W. Groetsch, Head, Department of Mathematical Sciences, M.L. #25, University of Cincinnati, Cincinnati, OH 45221. U.C. is an AA/EOE.

MATHEMATICS POSITION ANNOUNCEMENT
Trinity College of Vermont is seeking an Assistant Professor of Mathematics for a position beginning September 1986. Responsibilities include teaching general college mathematics as well as upper level courses for mathematics majors. Candidates with a Ph.D. or D.A. degree preferred. Please send curriculum vitae and three letters of recommendation to:
   Dr. Joseph A. Izzo, Chair
   Natural Sciences and Mathematics
   Trinity College
   Burlington, VT 05401
Trinity College is a liberal arts undergraduate institution in the Catholic tradition serving traditional women and non-traditional women and men students. AA/EOE

SAINT MICHAEL'S COLLEGE
MATHEMATICS DEPARTMENT.
One (1) entry level, tenure track position in mathematics to begin September 1986. Ph.D. preferred but applicants with master's degree plus teaching experience will be given careful consideration. Apply by Feb. 1, 1986 to Personnel Office, St. Michael's College, Winooski, VT 05404. An Equal Opportunity/Affirmative Action Employer.

MOORHEAD STATE UNIVERSITY
Mathematics Department
Moorhead, MN 56560
Tenure-track position at the rank of assistant professor beginning September 1986. A Ph.D. in mathematics education or an Ed.D. and master's level preparation in mathematics are required. Elementary and/or secondary teaching experience is desirable. Duties include teaching undergraduate mathematics courses and elementary and secondary methods courses. First screening of applications on February 15, 1986—applications accepted until filled. Apply to: Milton Legg, Chair, Mathematics Department. An equal opportunity/affirmative action employer.

Applied Mathematics
University of Washington
Applications and nominations are invited for one position budged as a tenure-track assistant professor. Outstanding candidates at higher levels may also be considered. Candidates should have a demonstrated record of research in any area of applied mathematics. They should also have substantial experience in some area of appli-

cations as well as a breadth of interest in mathematics relevant to the teaching requirements of the department. Applications (with a resume and three letters of recommendation) will be accepted by:
   Professor Frederic Wan, Chairman
   Department of Applied Mathematics, FS-20
   University of Washington
   Seattle, Washington 98195
until the position is filled. The University of Washington is an Equal Opportunity/Affirmative Action Employer.

Four tenure-track positions Fall 1986. Doctorate is desirable. Interested in applicants from all areas of mathematics with a commitment to excellence in teaching and scholarly activity. Teaching load 9-12 hours per week; possibility for released time for research. Contact Dr. DiPietro, Eastern Illinois University, Charleston, IL 61920. AA/EOE

The Department of Mathematics and Computer Science announces a tenure track position in mathematics. The applicant must have a background in an area of applied mathematics and a strong interest in computer science. A Ph.D. in mathematics with industrial or teaching experience is preferred; however, candidates with a strong Master's degree and appropriate industrial or teaching experience will be seriously considered. Candidates are expected to teach graduate and advanced undergraduate courses and to possess strong verbal skills. Rank and salary are commensurate with qualifications. Starting date September, 1986. Applications including graduate transcripts and three letters of recommendation, should be sent to Dr. Thomas L. Pirnot, Dept. of Mathematics and Computer Science, Kutztown University, Kutztown, PA 19530. Applications should be received by February 15, 1986. Kutztown University is an Affirmative Action/Equal Opportunity Employer and actively solicits application from qualified minority applicants.

Three new tenure-track positions at the asst., assoc. and/or full professor level have been allocated to the department. Applicants in all area of statistics are invited. Ph.D. in probability or stat. required. Criteria for selection: excellence in research, teaching, novel applications of statistics, computing and consulting skills. Resume and 3 letters of recommendation to: T.P. Hettmansperger, 219E Pond Lab., Penn State Univ., University Park, PA 16802. Deadline: Feb. 15, 1986 or until filled. AA/EOE.

MATHEMATICS DEPARTMENT
Heidelberg College is seeking a person to fill a full-time position in the Department of Mathematics for the fall of 1986. The ideal candidate should have a Ph.D. in mathematics and undergraduate teaching experience. Heidelberg College has 1000 undergraduate students and a history of strength in the sciences. This position is a wonderful opportunity for the person who wants to be involved with students and considers teaching the most important aspect of a faculty position. Send letters of application, resume, and names of three references to:
   Dr. Preston Forbes
   Vice President for Academic Affairs
   Heidelberg College
   310 East Market Street
   Tiffin, Ohio 44883
Heidelberg College is an Affirmative Action/Equal Opportunity Employer.

MATHEMATICS FACULTY POSITION—Master's degree or equivalent in Mathematics. Applicant must be enthusiastic, versatile, and possess the ability to teach a wide range of Mathematics courses from the remedial through college level. Previous community college teaching experience preferred. Review of applications will begin on February 14, 1986, and continue until the position is filled. Probationary appointment starting Fall 1986. Send letter of application and resume to:
   Director of Personnel
   Mohawk Valley Community College
   1101 Sherman Drive
   Utica, NY 13501-5394
AN EQUAL OPPORTUNITY EMPLOYER

WILLAMETTE UNIVERSITY, SALEM, OR 97301
Tenure track position beginning Aug. 1986. Prefer to hire at Assistant Professor level. PhD in mathematics is required. Commitment to teaching and scholarship and a broad interest in liberal arts desired. Salary commensurate with experience. Postmark a detailed letter of application, 3 letters of recommendation and graduate transcripts by February 7, 1986 to: Steve Prothero, Chairman, Mathematics Department (address above). Independent and coeducational, University has 1400 undergraduates, a College of Law, and a Graduate School of Management. An Equal Opportunity Employer; women and minorities are encouraged to apply.

Department of Mathematics and Computer Science
San Jose State University
San Jose, CA 95192-0103
Five openings for Assistant or Associate Professor (Professor in exceptional case), Ph.D. in any mathematical science; but prefer computer science, applied mathematics, mathematics education or numerical analysis. Candidates must have demonstrated high ability and interest in undergraduate teaching at all levels and be able to take an active role in department affairs. Approximate salary $24,000-$46,000 per academic year. Significant professional activity required for eventual tenure consideration. Application no later than February 3, 1986. EEO/AA

MATH DEPT: UNIVERSITY OF NORTH DAKOTA
GRAND FORKS, ND 58202
Applications invited for tenure track position at Asst. Prof. level in Math, starting 8/16/86. Requirements: PhD in Applied Math or in Math with strong concentration in Applied Math along with commitment to teaching and interest in research. Teaching load is 3 courses per semester. Salary competitive. Send vita, 1 copy of graduate transcripts and 3 names of references to Selection Committee. Initial screening begins Feb. 15, 1986.
UND is an EO/AAE

SOUTHEAST MISSOURI STATE UNIVERSITY
CAPE GIRARDEAU, MISSOURI 63701
Tenure-track position at Instructor or Asst. Prof. level. Aug. 25, 1986. Ph.D. in mathematics required. Some collegiate teaching experience required. Normal load is 12 hours per semester, includes freshman level service courses. Research and scholarly activity encouraged. Send resume, 3 letters of recommendation, and transcripts to Harold Hager, Chairperson. Application deadline February 28, 1986. An Equal Opportunity/M-F/Affirmative Action Employer.

MATHEMATICS DEPARTMENT
WASHINGTON AND LEE UNIVERSITY
LEXINGTON, VIRGINIA 24450
Two tenure-track positions beginning September, 1986. Assistant professor level, Ph.D. required. One appointment in Analysis/Numerical Analysis designated a Dana Fellow. Quality instruction emphasized, small classes, no graduate program. Send VITA, three references, and graduate transcript to Search Committee at the address above. Equal Opportunity Employer.

Mathematics Department Chairman position. Requirements: Ph.D. in Mathematics, college teaching experience. Preference given to candidates with administrative experience and course work in Computer Science or Mathematics Education. Date of appointment: Fall 1986. Send letter of application, resume, transcripts, and three letters of reference to Personnel Office, Box C-13, Sul Ross State University, Alpine, Texas 79832. Telephone: (915) 837-8058. An equal opportunity/affirmative action employer.

Elmhurst College has a tenure track position open beginning the Fall of 1986. Elmhurst College is a moderate-sized private liberal arts college in the western suburbs of Chicago, Illinois. Applicants should have or be completing a Ph.D. degree. Interested applicants should submit a vita and three letters of recommendation to: Dr. Donald Mason, Department of Mathematics, Elmhurst College, 190 Prospect, Elmhurst, Illinois 60126.

SOUTHWEST MISSOURI STATE UNIVERSITY
DEPARTMENT OF MATHEMATICS
Applications are sought for several positions of Professorial rank. It is hoped to fill at least one Professorship, one Associate Professorship and two Assistant Professorships for Fall 1986. All positions are tenure track (or tenured). Applications for visiting positions will certainly be considered.
A Ph.D. in mathematics or statistics, and a commitment to teaching are required. For senior appointments an established research record and the ability to work alone are essential. Some preference may be given to candidates whose research speciality is in analysis, applied analysis, or statistics, but all specialities will be considered. Applicants should send a complete Curriculum Vitae and the names of at least three referees to the Department Head, Simon J. Bernau, Department of Mathematics, Southwest Missouri State University, Springfield, Missouri 65804-0094.
Southwest Missouri State University is an equal opportunity, affirmative action employer.

COMPUTER SCIENCE FACULTY
Applications are invited for a tenure-track faculty position in Computer Science starting August 1986. Rank and Salary are dependent on Qualifications. A Ph.D. in Computer Science or in a related area is preferred. Potential for growth as a computer scientist is required. Persons holding a Master's degree in Computer Science with expe-

rience in industry and/or teaching are also encouraged to apply for the position of Instructor. Duties include undergraduate and graduate teaching and research. Opportunities to work within the Ada Education and Software Development Center of the Capitol Campus are available. Send resume, transcripts and references to Dr. William A. Welsh, Jr., Box MAA Division of Sciences, Engineering and Technology, The Pennsylvania State University, The Capitol Campus, Middletown, PA 17057. Positions open until filled.
THE PENNSYLVANIA STATE UNIVERSITY IS AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER.

Two faculty positions at Assistant or Associate Professor level. Qualifications: PhD in Statistics or Operations Research (emphasis stochastic modeling). Duties include teaching and working with students on applied projects. Prior to Feb. 1, send vita, transcripts, and letters of recommendation to Prof. F. Sheehan, Mathematics Department, San Francisco State University, San Francisco, CA 94132.

ROANOKE COLLEGE, Salem, VA 24153. Tenure-track appointment at the Assistant or Associate Professor level beginning August 1986. Ph.D. in Mathematics required with formal training in Computer Science preferred. Salary commensurate with qualifications. Excellent teaching emphasized, active scholarship encouraged. Commitment to liberal learning expected. Send vita, graduate transcript, and three letters of recommendation by February 1, 1986 to Dr. William D. Ergle, Mathematics Department. AA/EO

Several positions, tenure-track and temporary, are anticipated for 1986-87. Areas desired are algebra, statistics, applied mathematics and computer science. For tenure-track positions a Ph.D. or near Ph.D. is required. For all positions commitment to excellence in teaching and potential for research and professional growth must be evident. A complete application must include a letter of application, resume, three letters of reference and transcripts of all undergraduate and graduate study. Send to: Lanny Morley, Head, Division of Mathematics and Computer Science Northeast Missouri State University Kirksville, MO 63501
EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER

The College of Wooster, Wooster, Ohio 44691, Donald Beane, Chairperson, Department of Mathematical Sciences. Assistant Professor to teach elementary and advanced courses in undergraduate mathematics. Specialty in numerical analysis preferred. Strength in statistics and/or math education helpful. Ph.D. in mathematics or near completion. Participate occasionally in freshman seminar program. AA/EOE.

UNIVERSITY OF ROCHESTER, DEPARTMENT OF MATHEMATICS
ROCHESTER, NEW YORK 14627
The department anticipates tenure-track or visiting appointments, beginning September 1986. Teaching duties are two courses each semester. Initial tenure-track appointment will be for 3 or 4 years. A Ph.D., outstanding research promise, and excellence in teaching, are required. There is no restriction as to field; however, the department is particularly interested in candidates in algebraic geometry, algebraic number theory, algebraic topology, mathematical physics, and probability. Candidates should send a resume and the names of at least three references, addressed to Chairman, Mathematics Department. An equal opportunity, affirmative action, employer.

EASTERN MONTANA COLLEGE, DEPARTMENT OF MATH
BILLINGS, MT 59101-0298
Asst. Professor or rank open, subject to negotiation. Four tenure-track positions begin 9/86. Requirements include Ph.D. or equivalent in math, computer science, statistics, or mathematics education. Please send resume and vita, three letters of recommendation, transcript to Mr. Archie M. Sutton, Equal Opportunity/Personnel Director, Eastern Montana College, Billings, MT 59101-0298. EMC is an Affirmative Action/Equal Opportunity Employer.

MATHEMATICS/COMPUTER SCIENCE: Tenure-Track position beginning Fall, 1986. Opening subject to funding. Teach a mixture of undergraduate mathematics and Computer Science courses. Ph.D. in mathematics with masters in CS desired. Will consider Ph.D. in mathematics with demonstrated competence in CS. Teaching load of three courses per semester. Computing facilities include 2 VAX 11/730s and VAX 11/750 net-worked via Ethernet, one IBM 4341 and assorted micro-computers. Applications close March 1, 1986. Send cover letter, resume, official graduate transcript, and three letters of reference to: Professor David L. Hull, Chair, Department of Mathematical Sciences, Ohio Wesleyan University, Delaware, Ohio 43015. Ohio Wesleyan University strongly encourages applications from qualified female and minority candidates. An Equal Opportunity Affirmative Action Employer.

Grinnell College
Grinnell, Iowa 50112

Tenure track position as Asst Prof beginning Fall 1986. Ph.D. required and demonstrated excellence in teaching as well as evidence of scholarship. Expected to teach a variety of courses in context of a highly selective liberal arts college. A number of fields of specialization would be appropriate for this position. Send vita and letters of reference to Arnold Adelberg, Chmn, Dept of Math, Grinnell College, Grinnell, IA by Feb 1, 1986.

Grinnell College is an affirmative action/equal opportunity employer and especially seeks women and minority candidates.

MATHEMATICS EDUCATION

Northeastern State University serving nearly 8,000 students, has a full-time tenure track position open in Mathematics Education beginning August 18, 1986. Doctorate in Mathematics Education required, experience at elementary school level, inservice preparation of elementary school level, inservice preparation of elementary school teachers and using computers in an educational setting preferred. Duties include teaching undergraduate and graduate courses in the pre-calculus sequence. Closing date for applications is February 1, 1986. Submit letter of application, resume, three letters of recommendation, and transcripts to:

    Personnel Services
    Northeastern State University
    Tahlequah, OK 74464

An equal opportunity/affirmative action employer.

ST. OLAF COLLEGE
Northfield, Minnesota 55057

Fall, 1986. The Department of Mathematics anticipates two positions at the assistant professor level. One of these is potentially tenure track. Applicants must have a clear commitment to excellence in teaching and an appreciation for the value of the liberal arts. Send a resume, three letters of recommendation, and a statement of professional goals and interests to: Paul D. Humke, Chair, Department of Mathematics. The selection procedure will begin 1/15/86. Applications for visiting positions at all ranks are sought.

St. Olaf, a college of the American Lutheran Church, is an equal opportunity employer and specifically invites applications from women and minorities.

Tenure-track and visiting positions in mathematics, applied mathematics and statistics are available beginning September 1986. Excellent teaching and a commitment to research are required. Some 3-year instructorships may also be open. The department offers B.S. and M.S. degrees. MTU is a state supported university emphasizing science and engineering. To apply, write: Dr. Martyn R. Smith, Head, Mathematical and Computer Sciences, Michigan Technological University, Houghton, MI 49931

Michigan Technological University is an equal opportunity educational institution/equal opportunity employer.

Assistant Professor, tenure track position beginning Sept. 1986. Hendrix College, Conway, Arkansas 72032. Teach introductory through advanced undergraduate mathematics, participate in an established undergraduate research program, and contribute to several of the curricular areas of applied mathematics, statistics, and mathematics education. Ph.D. in mathematical sciences, demonstrated teaching excellence and promise for continued professional growth essential. Evaluations of applicants will being Feb. 1, 1986. For consideration, send cover letter, vita, 3 letters of recommendation and transcripts to Robert C. Eslinger, Chairman, Department of Mathematics. Hendrix College is an equal opportunity employer.

TEACHING FACULTY
MATHEMATICS/COMPUTER SCIENCE
RHODE ISLAND COLLEGE

To teach computer science and mathematics courses, do scholarly work, participate in departmental or college committees including curriculum development. Tenure line, beginning fall 1986. Requirements: Ph.D. in Computer Science, or Ph.D. in Mathematical Sciences with ability to teach some computer science courses. Salary, rank competitive, commensurate with qualifications. Attractive fringe benefits. Summer employment available. Rhode Island College is a pleasant, modern conveniently located campus, and institutional member of ACM, MAA and committed to high quality teaching, research and program development. Hardware includes IBM 4341, DEC VAX, and micro labs. Send application, resume, transcripts, and three current letters of reference to Chair, Mathematics and Computer Science Department, Rhode Island College, Providence, RI 02908. Application due date is February 18, 1986. Availability of position contingent upon funding.

Saint Joseph's University

The Department of Mathematics and Computer Science has a tenure track position available beginning September, 1986. Applicants should have a Ph.D., be committed to teaching and have an interest in research. Those interested should send a resume to: Thomas J. O'Reilly, Chairman, Department of Mathematics and Computer Science, Saint Joseph's University, Philadelphia, PA 19131.

An Equal Opportunity/Affirmative Action employer.

Department of Mathematics, Bowdoin College Applications invited for Assistant Professor starting September, 1986. Tenure-track position; initial appointment three years with renewal possible. Ph.D. required and strong research record or potential expected. Normal teaching load 6 hours per week. Candidates with record of effective undergraduate teaching preferred. Applications accepted until position filled; review of candidates begins 18 February. Send resume and 3 letters of recommendation to Chairman, Department of Mathematics, Bowdoin College, Brunswick, ME 04011. Bowdoin College is committed to Equal Opportunity through Affirmative Action.

Department of Mathematics, Bowdoin College Applications invited for visiting faculty member, rank open, starting September, 1986. Terminal position; one year with second year possible. Ph.D. expected. Normal teaching load 6 hours per week. Candidates with record of effective undergraduate teaching preferred. Applications accepted until position is filled; review of candidates begins 1 March. Send resume and three letters of recommendation to Chairman, Department of Mathematics, Bowdoin College, Brunswick, ME 04011. Bowdoin College is committed to Equal Opportunity through Affirmative Action.

KENYON COLLEGE MATHEMATICS DEPARTMENT
GAMBIER, OH 43022

Sabbatical replacement for period 1/86 through 6/87. Rank: visiting instr. or vis. asst. prof. Willing to appoint for all three semesters or separately for spring 1986 and acad. year 1986-87. Possibility of renewal for 1987-88. For one sem. appointment, substantial graduate work in math, pref. master's or beyond expected. Teaching load is 3 courses/sem. in math or possibly math and computer sci. for candidates with math and CS qualifications. To express interest or ask for information telephone Robert M. McLeod at (614)427-2244, Ext. 2268. Send vitae, transcripts, and three letters of reference (at least one regarding teaching) to Chair, Mathematics Department, Kenyon College, Gambier, OH 43022. Kenyon is an EOE.

UNIVERSITY OF SASKATCHEWAN

Tenure track Assistant Professor position beginning July 1986. Ph.D. in Probability Theory or PDE. Send resume by February 28, 1986 to: R. Manohar, Mathematics Department, University of Saskatchewan, Saskatoon, Canada S7N 0W0. In accordance with Canadian Immigration requirements, this advertisement is directed to Canadian citizens and permanent residents.

STATE UNIVERSITY OF NEW YORK
COLLEGE AT PURCHASE, PURCHASE, NY 10577

Tenure track, rank open, beginning 9/86. Ph.D. or ABD required with research or scholarly interest preferably in Differential Equations or applications. Must teach a broad range of undergraduate courses including some intermediate or advance computer related. Math will graduate 20 seniors this year. Purchase is in suburban Westchester 30 miles north of NYC. Send resume, other supporting materials, and names of three references to Dr. Frederick Solomon, Chairperson, Mathematics Search Committee, Division of Natural Science by 3/15/86. AA/EO

DICKINSON COLLEGE
DEPARTMENT OF MATHEMATICAL SCIENCES
CARLISLE, PENNSYLVANIA 17013

Tenure-track position at the Assistant Professor level beginning September 1986. Slight preference for an individual specializing in mathematical logic, but individuals in other fields are encouraged to apply; willingness to teach entry-level computer science courses is desirable. Ph.D. required. Commitment to undergraduate teaching and to continuing research. Teaching load is three courses (usually two preparations) per semester. Send application, resume, and three letters of recommendation to Dr. Robert Paul, Chairman. Dickinson College is an Affirmative Action/Equal Opportunity Employer.

Mathematics: Tenure-track position in mathematics available beginning August of 1986. Applicant should have Ph.D. in mathematics. An applied mathematics background is also preferred but not required. Duties include undergraduate teaching in mathematics. The university stresses quality teaching. Rank and salary are commensurate with qualifications and experience. Send resume and names of three references by March 1, 1986 to: Dr. Carlos G. Spaht, Chairman, Math & CSC Dept., LSU-S, Shreveport, LA 71115. Equal Opportunity/Affirmative Action Employer.

Tenure track mathematics position beginning August, 1986. Doctorate required (or be able to complete within three years). Milligan is a Christian, four year, liberal arts college associated with the Christian Church. Contact Dr. Kenneth W. Oosting, Academic Dean, P.O. Box 129, Milligan College, TN 37682.

MATHEMATICS/COMPUTER SCIENCE
Emporia State University
Emporia State University invites applications for one or more tenure track appointments at rank of Assistant or Associate Professor. Ph.D. in Mathematics, Computer Science, or Statistics desired. Strong background in computer science required. Excellence in teaching and commitment to scholarly and creative activities expected. Send resume and three letters of reference to Dr. John Carlson, Chair, Division of Mathematical and Physical Sciences, Emporia State University, Emporia, Kansas 66801. Application deadline, February 15, 1986. An Equal Opportunity Employer.

SUNY COLLEGE AT BROCKPORT
MATHEMATICS/COMPUTER SCIENCE DEPT.
BROCKPORT, NY 14420
Tenure-track position in Computer Science available September 1986. Candidates should have strong commitment to Computer Science education. Ph.D. in Computer Science or related area required. Masters' level expertise in Computer Science necessary. Preferred specialization in Operating Systems, Microprocessor, or Networking. For particulars contact: Dr. K. Nakano, Chairperson, Department of Mathematics/Computer Science (phone: 716-395-2194). To apply, send a letter of application and resume, and have three letters of reference sent by February 7 to the Office of Faculty/Staff Relations, SUNY College at Brockport, Brockport, NY 14420. EO/AAE

The Calvin College Department of Mathematics and Computer Science expects to have positions available for the 1986-87 academic year. Applicants in Mathematics, Computer Science, and Mathematical Statistics will be considered. The Department currently has 18 full-time faculty and nearly 100 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 T. Jager, Chairman, Dept. of Mathematics and Computer Science, Calvin College, Grand Rapids, MI 49506. Calvin College is an equal opportunity, affirmative action employer.

Marian College, Indianapolis, IN 46222. Full-time position. Responsibilities include directing of microcomputer center and teaching computer science courses. Doctorate in computer science or mathematics preferred. Master degree required. Teaching experience preferred. Small liberal arts college. Equal opportunity employer. Send resume and three references to Sister Carol Slinger, Chair, Mathematics Department.

Department of Mathematics
University of Alberta
Applications are invited for three tenure-track positions at the Assistant Professor level starting July 1, 1986. Requirements are a Ph.D. and proven ability or demonstrated potential for research and teaching. Starting salary approximately $30,316 (Canadian) per annum. Send vitae and arrange for three letters of reference to be sent to: J.W. Macki, Chairman, Department of Mathematics, University of Alberta, Edmonton, Canada T6G 2G1. The University of Alberta is an equal opportunity employer, but in accordance with Canadian Immigration requirements, this advertisement is directed to Canadian citizens and permanent residents. Closing date for application is March 31, 1986.

Temporary one-year positions avail. Sept. 1, 1986. Ph.D. in mathematics or statistics required, at asst., assoc., or prof. level. Teach undergraduates and perform research. Resume, supporting documents, and 3 letters of reference by Feb. 15, to Thomas A. McCready, Chair, Dept. of Math., Calif. State Univ., Chico, CA 95929. EO/AAE.

Tenure-track position avail. Sept. 1, 1986. Ph.D. in mathematics required, at asst., assoc., or prof. level. Teach undergraduates and perform research. Resume, supporting documents, and 3 letters of references by Feb. 15 to Thomas A. McCready, Chair, Dept. of Math., Calif. State Univ., Chico, CA 95929. EO/AAE.

FACULTY POSITION: MATHEMATICS
The University of Pittsburgh at Johnstown announces tenure stream faculty opening in Mathematics at the Assistant Professor level for September 1, 1986. Background in statistics. Doctorate strongly preferred. Interest in teaching all levels of undergraduate mathematics. Strong motivation for continuing professional development. Application deadline: March 15, 1986 or later if position is not filled. Send resume, three references and supporting documents to Dr.

John D. Wilson, Search Coordinator, Department of Mathematics, University of Pittsburgh at Johnstown, Johnstown, PA 15904. UPJ is an Equal Opportunity/Affirmative Action Employer.

INDIANA UNIVERSITY AT KOKOMO
KOKOMO, IN 46902
Tenure-track assistant professorship beginning 8/86. Responsibilities include 9 hours of undergraduate teaching each semester, research and service. Qualifications include a Ph.D. in mathematics or equivalent and a commitment to teaching. Send resume, graduate transcripts, and 3 letters of reference to Robin G. Symonds, Coordinator, Dept. of Math and Info Science. Applications received by Feb. 10 are assured of consideration. Equal Opportunity/Affirmative Action Employer.

Miami University
Oxford, Ohio 45056
The Mathematics and Statistics Department anticipates three tenure track positions beginning in August, 1986. Two will be on the main campus (Oxford) and one on a regional campus (Middletown). Miami is a state supported university in southwestern Ohio which offers Bachelor's, Master's and MAT degrees in mathematics and statistics on the Oxford campus and Associate of Arts degrees at the Middletown campus. Subject to budget approval, we will have:
1) A tenure track assistant professorship on the Oxford campus. Candidates should have a Ph.D. in pure or applied mathematics by August, 1986. Duties will include teaching an average of eight hours per semester of undergraduate and graduate courses, plus continuing scholarly publication. Application deadline: February 1, 1986.
2) A tenure track assistant professorship on the Oxford campus in mathematics education. Candidates should have a master's degree or equivalent in mathematics or statistics and a Ph.D. or Ed.D. degree in mathematics education by August, 1986 with expertise in problem solving. Duties will include teaching an average of eight hours per semester in undergraduate and graduate courses plus continuing scholarly publication. This position is associated with a joint K-12 curricular research and development project being conducted by Mathematics and Statistics and the Teacher Education Department. Application deadline: March 15, 1986.
3) A tenure track assistant professorship on the campus in Middletown. Candidates should have a doctoral degree in mathematics, statistics, or mathematics education by August, 1986. Duties include teaching an average of twelve hours per semester of freshman and sophomore courses, professional service, and scholarly publication. Application deadline: February 1, 1986.
All candidates should have strong teaching credentials. To apply for any of these positions, please send vita, transcripts, and three reference letters to David J. Lutzer at the above address by the indicated deadline dates. Late applications may be considered. Women and minority candidates are strongly urged to apply. AA/EEO

 ROCHESTER INSTITUTE OF TECHNOLOGY
DEPARTMENT OF MATHEMATICS
ROCHESTER, NY 14623
Tenure-track position for September 1986. Ph.D. preferred. Applicant must have primary interest in undergrad teaching, as well as doing some research or consulting. Dept. has undergrad major areas in applied statistics, comp. math and applied math. Salary competitive. Contact: Dr. David Farnsworth, Chair, Faculty Recruitment Committee. RIT is Affirmative Action/Equal Opportunity Employer.

PURDUE UNIVERSITY NORTH CENTRAL
CHAIR POSITION
Mathematics/Physics
The Campus: Purdue University North Central currently serves 2,700 students, with a full-time faculty of 64. The campus is situated on 264 acres of rolling and wooded land located eight miles south of Lake Michigan near the cities of La Porte and Michigan City, and Valparaiso. Its location offers both urban and suburban living, excellent school systems and extensive recreational facilities in the fastest growing area in Indiana. Nominations and applications are invited for the position of Chairperson of the Mathematics/Physics Section at Purdue University North Central. The Chairperson is responsible for the academic leadership and resource management of a section that supports a wide variety of transfer and campus level degree programs. Eligible candidates must have an earned doctorate in mathematics or a related field, undergraduate teaching, and academic administrative experience. Excellent oral and written communications skills in English required. Candidates should also present evidence of scholarly development, reflected in continuing research, publication or grant development. Applications with resumes, and nominations must be postmarked on or before January

31, 1986. Candidates may be asked for a list of references at a later date. Applications should be directed to:
Mrs. Diane M. Carpenter
Academic Operations Assistant
Purdue University North Central
Westville, Indiana 46391
Purdue University North Central is an equal access/equal opportunity employer.

Hartwick College, Oneonta, NY 13820
Department of Mathematics
Tenure Track position beginning September, 1986. Ph.D. required. 4-1-4 calendar, teaching load 3-1-3. Teach elementary as well as upper division courses. Applicants should submit letter of application, resume, and names of three references to Dr. Ronald M. Brzenk, Chair, Department of Mathematics. An Equal Opportunity Employer.

A tenure-track entry-level (Assist. Prof.) position is available in the Mathematics Department at Claremont McKenna College. Qualifications include a Ph.D. in mathematics, with some formal education in computer science. Responsibilities include teaching, research, and curriculum development. The appointee will be expected to teach traditional mathematics courses, courses involving applications of mathematics to business and economics, and beginning courses in computer science.
Compensation is competitive and shall depend in part on the appointee's qualifications. Claremont McKenna College is part of the Claremont College group, which has a total of approximately 40 mathematicians and computer scientists.
The College is an equal opportunity employer and invites applications from qualified persons of both sexes and all ethnic backgrounds. Applications will be accepted until March 1, 1986. Please arrange to have vita and at least three letters of recommendation sent to:
Professor G.L. Bradley, Chair
Mathematics Department
Claremont McKenna College
Claremont, CA 91711.

MATHEMATICS DEPARTMENT
United States Naval Academy
Applications are invited for a three year tenure-track appointment as an Assistant Professor commencing August 1986. Ten month salary is $24,600-37,900, commensurate with experience and qualifications. Research opportunities exist for augmenting salary during summer. Applicants must possess Ph.D., have a commitment to excellence in teaching, and be capable of pursuing independent research.
Send inquiries and applications to Prof. F.I. Davis, Chairman, Mathematics Department, U.S. Naval Academy, Annapolis, MD 21402. Required of each applicant are a resume, transcripts, and three letters of recommendation discussing applicant's teaching and research.
The Naval Academy is an EO/AA employer.

Lafayette College
Mathematics Dept., Easton, PA 18042
Assistant Professor (Ph.D. required) or instructor to teach undergraduate mathematics beginning late August, 1986. Teaching load 3 courses per semester. Lafayette offers liberal arts and engineering in a small (2000) college not far from New York City and Philadelphia. Salary competitive (1985 AAUP salary rating 1* in all ranks). Send resume, 3 reference letters, and telephone number (office and home) to Chairman, Mathematics Search Committee. An Equal Opportunity Employer.

Mathematics/Computer Science Position
John Brown University, located in scenic northwest Arkansas, seeks a faculty person to teach introductory mathematics courses through calculus and computer science courses at least through assembly language. Applicants should have at least a master's degree, should not use tobacco or alcoholic beverages, and should desire to make the Christian faith central in all activities. Rank and salary depend on qualifications and college teaching experience or equivalent. Send resume and letter of inquiry to A.J. Anglin, Academic Dean, JBU, Siloam Springs, Arkansas 72761.

Furman University
Two tenure track positions in mathematics beginning September, 1986. Ph.D. in mathematics or statistics preferred (necessary for tenure), an M.S. possibly accepted for one position. Deadline: February 15, 1986. Vita, transcripts and three letters of recommendation sent to Dr. Robert Fray, Chairman, Mathematics Department, Furman University, Greenville, South Carolina 29613. EEO/AAE

POSITION VACANCY
MATHEMATICS INSTRUCTOR
Laramie County Community College, Cheyenne, WY has an opening for a math instructor (college math courses through calculus sequence) for fall semester, 1986.
QUALIFICATIONS: Master's degree in mathematics required. College level teaching experience preferred. Engineering or computer science background desirable.
COMPENSATION: Starting salary $19,451–$22,552, corresponds to steps 0-3 salary schedule.
CLOSING DATE: March 15, 1986
BEGINNING DATE: Approximately last of August 1986. Applications and inquiries concerning the above position should be directed to:
Bruce Curl
Director of Personnel
Laramie County Community College
1400 East College Drive
Cheyenne, WY 82007
LCCC is an Equal Opportunity/Affirmative Action Employer

Gordon College, a Christian liberal arts college of approximately 1200 students, located 25 miles north of Boston, expects openings in both mathematics and computer science for 1986-87. Mathematics position requires a Ph.D. with an ability to teach courses in probability, statistics, operations research, mathematical modeling. Computer science position requires at least an M.A. in computer science and an ability to teach upper-level courses in the A.C.M. curriculum. Address inquiries to: Dr. R. Judson Carlberg, Dean of Faculty, Gordon College, Wenham, MA 01984, by Feb. 15, 1986.

Computing Science
Saint Mary's University, Department of Mathematics and Computing Science invites applications for a tenure-track position and a limited-term position effective 1 September 1986, both at the rank of Assistant Professor.
Applicants should have a doctoral degree in computing science; however, candidates with doctoral degrees in mathematics and a strong background in computing science are also encouraged to apply. Duties will include teaching and research. Candidates with a demonstrated ability to teach undergraduate computing science courses and a proven research record will be given preference. In accordance with Canadian immigration requirements, this advertisement is directed in the first instance to Canadian citizens and permanent residents of Canada. However, all qualified candidates are strongly urged to apply.
Applications, including the names of three references, should be sent to: Dr. P. Scobey, Chairman, Mathematics and Computing Science, Saint Mary's University, Halifax, Nova Scotia B3H 3C3.

Assistant/Associate Professor of C.S.; Tenure Track position at competitive salary; Must have Ph.D. in C.S. or Ph.D. in related field and M.S. equivalent in C.S.; Good retirement and employee benefits; Professional benefits negotiable; Contact Dr. Steward B. Carpenter, Midwestern State University, 3400 Taft, Wichita Falls, Texas 76308, 817-692-6611 x4279.

The Department of Mathematics and Computer Science at Providence College invites applications for two positions in Mathematics and one position in Computer Science. Applicants should possess the Ph.D. Candidate with an M.S. in Computer Science will be considered for a non-tenure track appointment. Please sent vita, transcripts and the names of three references to: Search Committee, Department of Mathematics and Computer Science, Providence College, Providence, RI 02918.

THE UNIVERSITY OF ILLINOIS AT CHICAGO
The Department of Mathematics, Statistics, and Computer Science invites applications for tenure-track and tenured positions in Mathematics and Computer Science Education. The Department offers the stimulating environment of a highly rated Mathematics Department along with a strong commitment to the improvement of pre-college education. It currently has a number of successful programs in the area of pre-college mathematics and computer education. These include undergraduate programs for the certification of elementary and secondary teachers; an M.S.T. degree program; a Doctor of Arts program; courses for gifted pre-college students; an extensive teacher in-service and continuing education programs.
The department has received funding to expand and improve these programs and to set up a center for further development of the following activities: research in the teaching and learning of mathematics; study of the impact and applications of new technology such as microcomputers; curriculum improvement in pre-college mathematics and computer instruction; inservice programs for the enhancement of primary and secondary teachers. Applicants must have a Ph.D. in Mathematics, Mathematics Education, Computer Science, or related field, an outstanding research and publication

record, experience in undergraduate and graduate teaching and previous involvement with teacher education programs. Applications are also invited for visiting positions of 1 or more quarters. Send vita and direct 3 letters of reference to John Wood, Chairman, Search Committee, Dept. of Mathematics, Statistics, and Computer Science. University of Illinois at Chicago, Box 4348, Chicago, IL 60680. AA/EOE.

Mathematics: Assistant or Associate Professor, tenure-track position, beginning in August 1986. Candidate should hold a doctorate in mathematics, should have teaching experience, and should have some expertise in computer science. Atlantic Christian College, a non-sectarian liberal arts college, is affiliated with the Christian Church (Disciples of Christ). The college enrolls 1300 students and is committed to excellence in education. Applicants are to send vita, including three references, by January 31, 1986, to Dr. Robert Frazier, Sr., Atlantic Christian College, Wilson, NC 27893.

ASSISTANT/ASSOCIATE PROFESSOR OF MATHEMATICS
The University of Maine at Presque Isle announces the position of Assistant/Associate Professor-Mathematics, pending funding. Tenure track position beginning September, 1986. Required: normally, Ph.D. Degree in Mathematics or related field, some background in computer science or operations research; Desired: record of effective college teaching and research. Responsibilities: 12-hour teaching load at all levels of undergraduate mathematics and introductory level computing; student advisement; campus committees; program development; continuing professional development within the discipline; assisting the University in meeting regional needs; occasional teaching at Outreach sites; conducting research consistent with the mission of the University. Closing date: March 14, 1986. Send application letter, vita, and three letters of recommendation to: Dr. Richard L. Kimball, Chairperson, Mathematics/Science Division, University of Maine at Presque Isle, ME 04769.
An AA/EO Employer

University of Idaho
Assistant or associate professor of Mathematics. Tenure-track. Ph.D. required. Teaching and research. To apply, send vita and three letters of reference to James Calvert, Dept. of Mathematics and Applied Statistics, University of Idaho, Moscow, ID 83843. AA/EO.

ANTICIPATED POSITION
Assistant Professor of Mathematics at 2 year campus. Ph.D. in mathematics required. Salary regionally competitive, commensurate with education and experience. One year appointment beginning August, 1986. Tenure track position. Applications from all qualified candidates are welcome; minorities and women are encouraged to apply. Send transcripts, Curriculum Vitae, and names and telephone numbers of three individuals willing to provide recommendations to:
Dr. Ben F. Martin
Dean of Academic Affairs
Louisiana State University at Alexandria
Alexandria, Louisiana 71302-9633
Applications must be received by March 1, 1986.
AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER

DEPARTMENT OF MATHEMATICS
UNIVERSITY OF WISCONSIN-EAU CLAIRE
At least two faculty positions at the rank of Assistant Professor. All specialities considered with some preference to those in algebra, geometry, operations research, or statistics. Twelve-hour teaching load in a primarily undergraduate teaching institution with graduate programs for teachers, and which actively encourages research and scholarly activities. Successful candidates must have a commitment to and demonstrated potential for excellence in teaching. One- or two-year initial appointment with 1986-87 year beginning on August 25, 1986. Closing date for applications: February 15, 1986, or until positions are filled. Send letter of application, resume, graduate and undergraduate transcripts, and three letters of recommendation to Dr. Marshall E. Wick, Chairman, at the above address. UW-Eau Claire is an affirmative action, equal opportunity employer.

DEPAUW UNIVERSITY
One tenure-track position is available and at least one more pending, in the Department of Mathematics and Computer Science at DePauw University. Qualifications are: a Ph.D. in computer science; a Ph.D. in mathematics with competence to teach intermediate and advanced level courses in an undergraduate computer science program; or a Ph.D. degree in mathematics (preference given to candidates who can teach computer science). A commitment to excellence in teaching at the undergraduate level is essential. Rank and salary are open and will be negotiated on the basis of qualifications and experience. Applicants nearing the completion of the Ph.D. will be considered. Couples are invited to apply for these positions. Send applications (include resume and 3 letters of recommendation) or inquiries to:

Dr. John R. Anderson, Chair, Department of Mathematics and Computer Science, DePauw University, Greencastle, IN 46135; telephone 317/658-4725. Applications will be considered until the position is filled.
An Equal Opportunity/Affirmative Action Employer.

Bellevue College, Dept. of Mathematics, Bellevue, NE 68005 is seeking an assistant professor to teach a full spectrum of undergraduate mathematics courses, including introductory computer science courses. The position begins Sept. 1986. A Ph.D. or Ph.D. candidacy is required. Send resume and three letters of recommendation by March 15, 1986 to Dr. J. Scholar, Chairperson, Division of Science and Mathematics. Bellevue College is a four-year liberal arts college and draws its students from the greater metropolitan Omaha area.

Two Assistant Professorships starting September 1986. Tenure track. Mathematics or Statistics doctorate required. For full information write: W.F. Cutlip, Mathematics Department, Cental Washington University, Ellensburg, WA 98926. EOE/AA/Title IX.

Continuing position to teach undergraduate mathematics courses at introductory and advanced levels. Master's required; additional training desirable. Applicants should possess desire to teach at a quality, church-related, liberal arts college. Send statements of interest, credentials, transcripts, three letters of recommendation, to: Dr. Stanley Caine, Hanover College, Hanover, IN 47243.

University of Missouri-St. Louis
8001 Natural Bridge Road, St. Louis, MO 63121
Computer science position starting in August 1986. Ph.D. and training/experience appropriate for teaching (2 courses/sem.) and conducting research in a growing CS degree program. Send vita: Fred Wilke, Chairman. Department of Mathematical Sciences. AA/EOE

Beloit College, Mathematics and Computer Science, Beloit, WI 53511. Tenure track Assistant or Associate Professor. We need someone who is an excellent teacher and scholar, broadly interested in liberal arts, and who has computer science as one area of professional interest. Deadline: February 1, 1986 for assured consideration. Apply to Philip Straffin, Chair, and arrange for transcripts and three reference letters to be sent.

NOTICE OF POSITION
MATHEMATICS
The Department of Mathematics at the University of Wisconsin-Oshkosh anticipates having one or more entry level tenure track positions beginning September 1986. The primary responsibility is to teach 12 hours of undergraduate mathematics and/or statistics each semester. Research, grant writing, and departmental committee work are encouraged. Good teaching is essential! Preferred candidates will have a Ph.D. in one of the Mathematical Sciences. Send application letter, vita, a complete set of transcripts, and three letters of recommendation to:
Dr. Norbert J. Kuenzi, Chairman
Department of Mathematics
University of Wisconsin-Oshkosh
Oshkosh, Wisconsin 54901
Screening will begin January 24, 1986
Equal opportunity/affirmative action employer

THE UNIVERSITY OF MISSISSIPPI
DEPARTMENT OF MATHEMATICS
Tenure-track and visiting faculty positions anticipated for Fall, 1986. Special attention may be given to applicants in the area of analysis or graph theory and combinatorics. Rank and salary will be commensurate with experience.
Application, vitae, and letters of recommendation should be postmarked by February 15, 1986, and sent to James F. Porter, Chairman, Department of Mathematics, University of Mississippi, University, MS 38677. Telephone (601) 232-7071. Equal Opportunity/Affirmative Action Employer.

Tenure-track position in the Department of Mathematics, September 1986. Earned doctorate (in hand or to be completed no later than June 1, 1986), and evidence of excellent teaching skills required.
Application deadline: January 30, 1986
Applications, including resume, transcript, and three letters of reference, should be sent to: Paul J. Parente, Chairman, Department of Mathematics, Southeastern Massachusetts University, North Dartmouth, Massachusetts 02747. SMU is an equal opportunity/affirmative action employer. Applications from members of minority groups and women are particularly encouraged.

MATHEMATICS/COMPUTER SCIENCE
The Virginia Military Institute
Tenure-track position as assistant professor or higher. The applicant

should have a strong interest in teaching and participating in the development of a strong computer science degree program. Preference will be given to an applicant with a Ph.D. in computer science or mathematics. Salary competitive, and dependent on degree, qualifications, and experience. Deadline for application is March 1, 1986. Send your resume to the Department of Mathematics, The Virginia Military Institute, Lexington, Virginia 24450. AA/EEO Employer.

BOISE STATE UNIVERSITY, DEPARTMENT OF MATHEMATICS
1910 UNIVERSITY DRIVE, BOISE, ID 83725

Mathematics/Computer Science: to teach core undergraduate computer science and lower-division mathematics. Tenure track. Doctorate required. Application must include application form, resume, graduate transcripts, three letters of reference.
Screening begins February 1, 1986.
Starting date: August 20, 1986.
Phone or write for details: Dr. Charles Kerr, Chairman, Department of Mathematics, Boise State University, Boise, ID 83725; (208) 385-1172.
BSU is an EEO/AA institution.

COMPUTER SCIENCE AND MATHEMATICS POSITIONS
VALPARAISO UNIVERSITY

If you are interested in providing strong leadership and/or depth to a CS major that has been in place for 5 years, you are invited to apply for tenure-track positions beginning Fall, 1986. PhD in CS preferred, Master's considered. Previous teaching experience desired. Expertise in one or more of the following areas is preferred: Art, Intelligence, Comp. Graphics, Data Communications and Networks, Operating Systems or Software Design.
If you are interested in contributing to a growing and dynamic undergraduate math program, you are invited to apply for tenure-track positions.
Qualifications desired: PhD in math with expertise in (1) Discrete Math, Graph Theory, Operations Research and/or Math Modeling or (2) Analysis, History and Philosophy of Math and/or Math Logic or (3) Elementary and Secondary Math Methods and Pre-college CS Education.
Valparaiso University is a private Lutheran University located in Northwest Indiana about 60 miles from Chicago and about 15 miles from Lake Michigan. The University has an enrollment of 3500 with 5 Colleges: Arts and Sciences, Business Administration, Engineering, Law and Nursing. Computer resources include a DG MV8000, Burroughs B25 work stations and many micros.
For all positions salary is very competitive and rank is dependent upon qualifications. Closing date for applications is Jan. 20, 1986 or until positions are filled. Interested candidates should send a letter of application and a resume to: Jerry Wagenblast, Chairperson, Dept. of Math and CS, Valparaiso University, Valparaiso, IN 46383. An EO/AA employer.

FULL-TIME TENURE TRACK POSITION IN MATHEMATICS

Instructor or Assistant Professor to start September 1, 1986. Doctorate in mathematics preferred; applicants with Ph.D. close to completion considered. U.S. citizenship or permanent resident status and excellent oral communication skills required. Russell Sage offers a traditional undergraduate mathematics curriculum. Teaching experience at the college level and computer science skills highly desirable.
   The successful candidate should be willing to make a long-term commitment to Russell Sage. Applications accepted until February 1, 1986. Send application materials (resume, transcripts and three references) to: John Hammer, Chairperson, Department of Mathematics and Computer Science, Russell Sage College, Troy, New York 12180.

RUSSELL SAGE COLLEGE

An Affirmative Action/Equal Opportunity Employer

SUNY—FREDONIA
Fredonia, New York 14063

The Department of Mathematics and Computer Science has a tenure-track position available January or September 1986. We are seeking someone qualified to teach upper-level courses in applied mathematics or computer science; applicants must have strong academic credentials or practical experience. The department has

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17 full-time faculty and offers strong baccalaureate programs; last year 27 students graduated in Mathematics and 18 in Computer Science. Laboratory facilities include a VAX 11/750, running UNIX, and a Burroughs B7900.
The College has 4500 students and is in a village of 12,000 people, located in Chautauqua County, westernmost in New York. The area is famous for its four-season beauty, with rolling hills, lakes, farms, and vineyards. Cultural and recreational opportunities abound, and the local schools are excellent.
A letter of application, a resume, and three letters of recommendation should be sent to Dr. Frederick Byham, Acting Chairman. An AA/EOE.

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
HOBART AND WILLIAM SMITH COLLEGES

Applications are invited for a tenure-track position, beginning September 1986. The Ph.D. in Mathematics is required, as well as a strong background (preferably a Master's) in Computer Science. Duties include teaching all levels of undergraduate mathematics and computer science, and participation in the General Curriculum. Candidates should have strong commitment to excellence in teaching and promise of continued scholarly activity. The teaching load is two courses per trimester. Salary is negotiable and competitive. Hobart and William Smith Colleges are coordinate, four year, liberal arts colleges with a combined enrollment of approximately 1800. They are located in Geneva, New York, a city of 15,000 on the northern shore of Seneca Lake. Within an hour's drive are three major universities: Cornell, Rochester, and Syracuse.
Applicants should send detailed resume, three letters of recommendation (at least one including comments on teaching ability), and undergraduate and graduate transcripts (unofficial photocopies are acceptable) to:
   Professor Lawrence Smolowitz, Chair
   Department of Mathematics and Computer Science
   Hobart and William Smith Colleges
   Geneva, New York 14456
The Colleges are an Equal Opportunity Employer.

WARREN WILSON COLLEGE has two openings for teachers, effective July 1, 1986.
Responsibilities include mathematics and software design and development through the advanced undergraduate level. The department provides courses which support a major in mathematics and minor in computer science for the bachelor of science degree, complemented with service and liberal arts courses. One of the appointees will chair the department; this position requires the Ph.D. and the other the M.Sc. with substantial teaching experience.
Warren Wilson is a fully accredited four year liberal arts college of about 450 undergraduates (and 50 graduate students in creative writing) located in a beautiful mountain setting near Asheville, N.C. Students combine work (15 hours a week in essential tasks for the College) and service with small class instruction in the liberal arts and sciences. Send resumes with three references to Director of Personnel, Box 5022, 701 Warren Wilson Road, Swannanoa, NC 28778. The College is a strong equal opportunity employer.

UNION COLLEGE, SCHENECTADY, NY 12308. We expect one to three temporary assistant professorships (one or two years). Excellence in teaching and interest in scholarly activity required. Teaching load is five courses per year; salary negotiable. Please sent vita and three letters to A.D. Taylor, Chairman, Department of Mathematics, at above address.

Computer Science and Mathematics position for Fall 86. PhD in reasonable area, ability to teach CS1 & CS2 of ACM 78, and genuine interest in expanding into upper level CS. Send resume, 3 letters (focus on teaching) to: Dr. Douglas L. Cashing, Dept of Math & Computer Science, St. Bonaventure Univ, St. Bonaventure NY 14778.

Instructorships
DEPARTMENT OF MATHEMATICAL SCIENCES. Applications are invited for one year temporary instructorships starting Fall 1986. Masters degree and strong commitment to teaching in mathematics required. Four course load. Applications including vita and names of references should be sent to Anton Zettl, Chair, Department of Mathematical Sciences, Northern Illinois University, DeKalb, IL 60115-2854, by February 15, 1986 or until positions are filled. EO/AAE.

The Department of Mathematics at Boston University anticipates several openings for Assistant Professors or Visiting Faculty members beginning September of 1986, pending budgetary approval. Teaching load 6 hours/week. Preference given to applicants who share research interests with current faculty members in algebraic geometry, number theory, probability, statistics, dynamical systems, applied mathematics, and related areas. Women and minorities are encouraged to apply. Send vita and three letters of reference to: Search Committee, Dept. of Mathematics, Boston University, 111 Cummington Street, Boston, Massachusetts 02215.

The Department of Mathematics at Boston University anticipates several openings at the Associate/Full Professor rank beginning September of 1986, pending budgetary approval. Fields of interest include statistics, dynamical systems and applied mathematics. Requirements include demonstrated excellence in research and a strong commitment to teaching at the graduate and undergraduate level. Applications and/or nominations to: Search Committee, Dept. of Mathematics, Boston University, 111 Cummington Street, Boston, Massachusetts 02215. Boston University is an Equal Opportunity/ Affirmative Action Employer.

Mathematics: York College of Pennsylvania seeks to hire a Tenure-track Assistant Professor of mathematics beginning September 1986. Ph.D. in mathematics desired but candidates with other degrees considered. Preference will be given to experience in secondary education mathematics programs, computer science and demonstrated teaching excellence. YCP is a private liberal arts college of about 2400 full-time students situated within two hours of Philadelphia, Baltimore and Washington, D.C. Send letter of application, resume, transcripts of all college work, and names, addresses and phone numbers of three references to: Chairman, Physical Sciences Department, York College of Pennsylvania, Country Club Road, York, PA 17405. AA/EEO.

UNIVERSITY OF SOUTH CAROLINA
Department of Mathematics
Applications are invited for anticipated tenure-track faculty positions at all levels. The Department intends to build on existing strengths and also to supplement these with a number of appointments in other areas, particularly in applied mathematics. However, applications in all areas of pure and applied mathematics will be considered. 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 in teaching at both graduate and undergraduate levels. A detailed resume, 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 University of South Carolina is an Affirmative Action/Equal Opportunity employer.

OBERLIN COLLEGE
OBERLIN, OHIO 44074
Position Available: Tenure-track, initial 4 year appointment in Mathematics Department starting 7/1/86. Statistics is the preferred specialty. Required: Ph.D. completed or expected by 9/86, strong commitment to undergraduate teaching, active and sustained research interests.
Rank and Salary: Commensurate with qualifications.
Please have resume, transcripts, and three letters of reference sent to George Andrews, Mathematics Department, Oberlin College, Oberlin, OH 44074 by 2/17/86. Applications received after that date will be considered until the position is filled. Oberlin College is an EO/AA employer.

OBERLIN COLLEGE
OBERLIN, OHIO 44074
Position Available: 2 year appointment in mathematics beginning 7/1/86.
Required: Ph.D. completed or expected by 9/86, strong commitment to undergraduate teaching, active and sustained research interests.
Rank and Salary: Commensurate with qualifications.
Please have resume, transcripts, and three letters of reference sent to George Andrews, Mathematics Department, Oberlin College, Oberlin, OH 44074 by 2/17/86. Applications received after that date will be considered until the position is filled. Oberlin College is an EO/AA employer.

OBERLIN COLLEGE
OBERLIN, OHIO 44074
COMPUTER SCIENCE
Position Available: Tenure-track, initial 4 year appointment in Computer Science beginning 7/1/86. Required: Ph.D. in CS or related field with expertise in CS, strong interest in undergraduate teaching in innovative major program, active research.
Rank and Salary: Commensurate with qualifications. Please have resume, transcripts, and three letters of reference sent to George Andrews, Mathematics Department, Oberlin College, Oberlin, OH 44074 by 2/17/86. Applications received after that date will be considered until the position is filled. Oberlin College is an EO/AA employer.

Possible Position:
OBERLIN COLLEGE
OBERLIN, OHIO 44074
COMPUTER SCIENCE Position
Visiting appointment in Computer Science for 1986-87. Required: Ph.D. in hand or expected by 9/86, expertise in CS, strong interest in undergraduate teaching, active research interests. Rank and Salary: Commensurate with qualifications. Please have resume, transcripts, and three letters of reference sent to George Andrews, Mathematics Department, Oberlin College, Oberlin, OH 44074 by 2/17/86. Applications received after that date will be considered until the position is filled. Oberlin College is an EO/AA employer.

McMASTER UNIVERSITY
DEPARTMENT OF MATHEMATICS & STATISTICS

The Department of Mathematics & Statistics, McMaster University, invites applications, subject to budget approval, for a tenure track Assistant Professorship starting July 1, 1986.
Candidates should have a Ph.D. and proven research ability in some area of Mathematics or Statistics, as well as capability in teaching. Of particular interest will be applicants in Modern Applied Mathematics or some fields of Statistics. Salary based on qualifications and experience. 1985/86 minimum is $26,576.
In accordance with Canadian Immigration requirements, this advertisement is directed to Canadian Citizens and permanent residents. Please send curriculum vitae and arrange for three letters of reference to:
B. Banaschewski, Chairman
Mathematics & Statistics
McMaster University
Hamilton, Ontario
L8S 4K1 Canada

ACADEMIC CHAIRPERSON
Division of Computer Science
and Mathematics
Marist College announces the creation of a new position, Chair of the Division of Computer Science and Mathematics. Formerly part of the Division of Science, the new Computer Science and Mathematics Division comprises strong well developed undergraduate programs in Mathematics, Computer Mathematics, and Computer Science (for approximately 500 full-time students); and 2 master degree programs, one in Software Engineering and one in Information Systems (for 250 students); and includes the College's distinguished Linus R. Foy Chair in Computer Science.
Marist College enrolls over 3000 undergraduate and 500 graduate students on a scenic campus in Poughkeepsie, New York, overlooking the Hudson River, 70 miles north of New York City. Within a 15 mile radius of the College, IBM employs over 30,000 individuals in its major laboratory and manufacturing facilities in Poughkeepsie, Fishkill and Kingston. Computer Science is one of the flagship programs at Marist, and just last year received a $4.5 million grant from IBM. The College also recently broke ground on a new Lowell Thomas Communications Center which will house both the Communications and Computer Science programs. Applicants should hold the Ph.D. degree in Computer Science or a related discipline, have substantial college-level teaching experience, have demonstrable research capabilities in an academic or industrial setting, and have experience in administration. The primary requirement for the position is the ability to provide strong leadership for growing and developing Computer Science programs at both the graduate and undergraduate levels.
The College is willing to provide an attractive salary and fringe benefit package commensurate with education and experience.
Applications will be reviewed starting January 18, 1986, and the search will continue until an acceptable candidate is found. Please send application to:
Vice President for Academic Affairs
MARIST COLLEGE
Poughkeepsie, NY 12601-1381
Marist College is an equal opportunity/
affirmative action employer.

1986 International Congress of Mathematicians

The International Congress of Mathematicians (ICM-86) will be held at the University of California, Berkeley, from Sunday, August 3, through Monday, August 11, 1986. There will be no MAA Summer Meeting; MAA members are encouraged instead to attend ICM-86.

Articles describing the Congress have appeared in the September, October, and November-December 1985 issues of *FOCUS*. The center section of the March-April 1986 *FOCUS* will feature the Congress.

Copies of the Second Announcement of the Congress, which contains information and forms for registration and housing for the Congress, may be obtained from: ICM-86, P.O. Box 6887, Providence RI 02940.

USCMI to Sponsor Pre-Congress Series of Invited Survey Talks

The U.S. Commission on Mathematical Instruction (USCMI) will sponsor a series of invited survey talks on August 2, 1986, the day before the opening of the Congress. The talks, to be held from 2:00 p.m. to 6:00 p.m., will be aimed at enhancing understanding and appreciation of some of the major research-related work to be presented at ICM-86.

The USCMI invites recommendations of potential speakers and their areas of interest. Send all suggestions to the session organizer: Warren Page, New York City Technical College, 300 Jay Street, Brooklyn, NY 11201.

Further details, including the names of speakers and the titles of their survey talks, will be announced in *FOCUS*.

MAA Sections Offer Summer Workshops and Short Courses

Allegheny Mountain

The Allegheny Mountain Section will offer a four-day short course in coding theory titled "Codes and Designs" from June 30 to July 3, 1986, at Allegheny College in Meadville, Pennsylvania. The lecturer will be Vera Pless of the University of Illinois at Chicago.

The course will consist of four two-and-one-half-hour lectures, supplemented by sessions devoted to problem-solving and contributed papers. Lecture topics will include an introduction to coding theory, classification of codes, and new developments in coding theory, with particular reference to combinatorial designs and projective planes.

For additional information, contact: Richard McDermot, Department of Mathematics, Allegheny College, Meadville, PA 16335, or David Wells, Department of Mathematics, Pennsylvania State University, New Kensington, PA 15068.

Maryland-DC-Virginia

Two five-day workshops, sponsored by the Maryland-DC-Virginia Section, will be given at Salisbury State College on the Eastern Shore of Maryland this June. This is the eleventh year the Section has sponsored workshops in applied mathematics.

"Mathematical Modeling", June 2-6, 1986, will be given by F.R. Giordano, U.S. Military Academy, and M.D. Weir, Naval Postgraduate School. The presentors are co-authors of a recent book in modeling intended for sophomores or juniors.

Giordano has been giving workshops in modeling for several years.

"Discrete Mathematics", June 9-13, 1986, will be given by J.T. Sandefur, Jr., Georgetown University. Sandefur has just completed a manuscript for an undergraduate text, *Discrete Mathematics with Finite Difference Equations*. He presented a discrete mathematics minicourse at the MAA Annual Meeting in New Orleans.

The cost, including room and board, will be $210 for each five-day workshop. For more information, write to Dr. B.A. Fusaro, Department of Mathematical Sciences, Salisbury State College, Salisbury, MD 21801, or phone (301)543-6470 or 6471.

Northern California

The Northern California Section of the MAA is sponsoring a three-week short course in computer graphics at California State University-Stanislaus, from July 28 to August 15, 1986. This course is designed for mathematicians who wish to teach computer graphics or to use graphics in their mathematics courses, publications, or research. It covers the materials in the usual one-semester computer graphics course and offers extensive hands-on experience in a dedicated graphics laboratory. A programming background is required.

The course will be taught by Steve Cunningham, who chairs the ACM-SIGGRAPH Education Committee. The tuition of $500 includes all materials and one-day trips to San Francisco and Yosemite Valley. Room and board are available on campus at an estimated cost of $400 (double occupancy) and $500 (single). For more information and application materials, call or write: Dr. Steve Cunningham, Computer Science Department, CSU Stanislaus, Turlock, CA 95380; (209)667-3176.
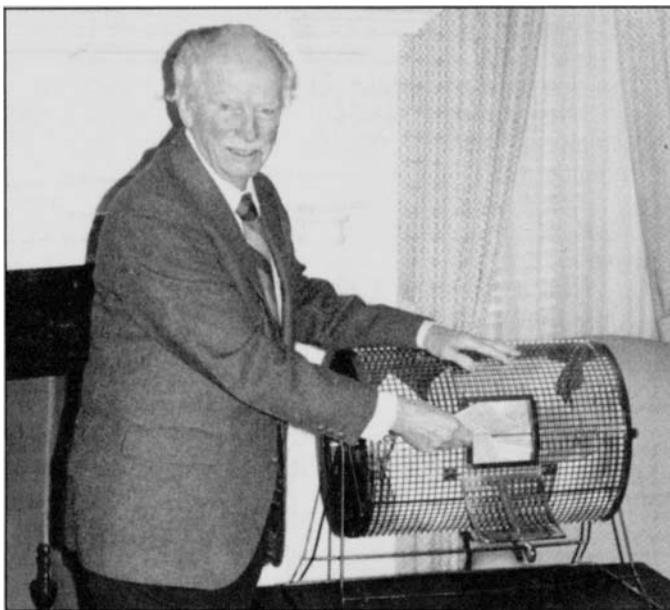
Ivan Niven, MAA Past-President, drawing the name of the lucky winner in the MAA's Nomination Campaign lottery. The grand prize, a trip for two to the New Orleans meetings, was won by Patrick Hayes of the Federal Reserve Bank of New York. The Nomination Campaign is part of a several-year effort to increase MAA membership. The Campaign has produced the names of over 5,000 nominees. Each nominee (who is not already a member) is receiving a personalized invitation to join the MAA.

MAA and OSU to Develop High School Modules on Applied Mathematics

The Mathematical Association of America and Oklahoma State University (OSU) are cooperating on a project, "Applications in Mathematics" (AIM), designed to develop and disseminate applied mathematics learning modules to secondary school teachers for classroom use. John M. Jobe and Jeanne L. Agnew of the Oklahoma State University mathematics department will lead this three-year project.

The project, modeled after the collegiate-level applied mathematics project TEAM (Teaching Experiential Applied Mathematics), will produce six learning modules using the discovery-learning approach. It will cost $742,000. Funds are being provided by a grant from the National Science Foundation.

The learning modules will be self-contained instructional packages, consisting of three video cassettes, a student resource handbook, a teacher resource book, and computer software. Each module will involve the student in problem-solving as it occurs in industry. The modules will be disseminated free of charge, starting early in 1987, on an order basis to the 15,000 secondary schools with grades of 9-12.

Three experts in secondary school mathematics curricula will provide an advisory and formative review group for the project.

In Memoriam

Edward D. Conway, III, Tulane University, died July, 1985, at the age of 48. He was an MAA member for 17 years.

Morris Hendrickson, University of New Mexico, died May 27, 1985. He was an MAA member for 38 years.

Stephen P. Hoffman, Professor Emeritus, Bates College in Honolulu, Hawaii, died September 8, 1985, at the age of 59. He was an MAA member for 32 years.

Allen J. Pope, National Geological Society, died August 29, 1985, at the age of 46. He was an MAA member for 5 years.

K.S. Purdie, of Lexington, Virginia, died October, 1985, at the age of 93. He was an MAA member for 57 years.

Otto J. Rambler, Professor Emeritus of Catholic University, died July 24, 1985, at the age of 98. He was an MAA member for 69 years.

Ivan L. Rose, of New South Wales, Australia, died August 19, 1985. He was an MAA member for 23 years.

Julius Widrewitz, of Manchester, New Hampshire died August 28 1985, at the age of 75. He was an MAA member for 16 years.

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

Nelson B. Conkwright, Professor Emeritus, the University of Iowa; **Ralph W. Erickson**, of Miami, Florida; **Istvan Fary**, University of California, Berkeley; **Earl V. Greer**, of Bethany, Oklahoma; **Orville Hamm**, St. Louis, Missouri; **Richard A. Howland**, Dickinson College; **Frederick G. Maskell**, of Ottawa, Ontario, Canada; **Jack M. Patterson**, of Bendix Corporation; **Amos F. Stalcup**, of Aurora, Illinois;**William L. Veeck**, of Kauai Community College.

$100,000 Bequest Made to MAA

The MAA has been notified that a $100,000 bequest has been designated for the MAA by one of its long-time members. Funds of the bequest will be used to support the MAA publications program and an award to a younger mathematician for expository writing. A portion of the interest from investment will be used each year also to help increase the corpus of the gift. The general bequest fund will be named for the donor; the award will be named in honor of a former teacher who was also an MAA member.

The new MAA Planned Giving Program will make it possible for the MAA to receive other such major gifts. Gifts of life insurance, stocks and bonds, personal and real property, annuities, charitable remainder trusts and gifts by will and bequest can be made to the MAA. For additional information, contact: Mr. Richard Witter, Development Officer, Mathematical Association of America, 1529 Eighteenth Street, N.W., Washington, D.C. 20036.

Planning Underway for Study of Collegiate Mathematics Resources

The MAA has received a grant of $18,950 from the Alfred P. Sloan Foundation to plan a comprehensive national study of resources for collegiate mathematics. The planning process is being led by Bernard Madison of the University of Arkansas.

A working session of about 20 individuals met at MAA Headquarters in December to help frame the proposed study. A detailed plan will be completed within a few months.

The study could include analysis of data to provide a national assessment of needs, resources, and opportunities in collegiate mathematics; articulation of standards for curricula, faculty, resources, quality, and productivity of college mathematics departments; and recommendations for action by various organizations responsible for higher education— colleges and universities, federal agencies, state governments, foundations, professional societies, and college faculty.

According to Madison, "There has never been a comprehensive study and report on the status of collegiate mathematics and the resources necessary for realizing its vast potential. Collegiate mathematical sciences education is a most important element in the future of our society, and there needs to be a sure understanding of its present status, its problems, its health, and its future directions. This is necessary both for our mathematical sciences faculty and for the American people."

The planning effort is a continuation of the work of the Joint Policy Board for Mathematics' (JPBM) Committee on the Status of the Profession. The current committee is sponsored by the MAA, with the support of the American Mathematical Society and the Society for Industrial and Applied Mathematics. Members are: Bernard Madison, Chairman; Wendell H. Fleming, Brown University; Ettore F. Infante, University of Minnesota; Stephen B. Maurer, Swarthmore College. Ex officio members are: Kenneth M. Hoffman, Massachusetts Institute of Technology; Lynn A. Steen, St. Olaf College and MAA President; and Marcia P. Sward, MAA Associate Director. Hugo Rossi, University of Utah, is the liaison for the National Research Council's Board on Mathematical Sciences.

Scholarship *(continued from page 2)*

next decade. On top of this, industrial demand and salaries remain high for students with bachelor's or master's degrees in the mathematical sciences: the academic focus of these "mental" or "artificial" sciences (as distinct from the "natural" sciences) resonates with the needs of industry for employees trained to work with abstract, quantitative, symbolic models. Finally, at the doctoral level, the number of new doctorates entering college and university mathematics departments has declined continuously for fifteen years, and is now as low as in the pre-Sputnik era. Moreover, over 40% of the Ph.D.'s, and in some departments over two-thirds of the graduate students, are not U.S. citizens.

We need a nation-wide mobilization to attract the best young minds to undergraduate mathematics, not just to replenish the Ph.D. pipeline, but to support all fields of science and engineering that build on solid training in undergraduate mathematics. The only effective way to do this is to make sure that across the country, in every college, large or small, there are mathematics teachers who are knowledgeable about recent advances in the mathematical sciences and conversant with the many interesting problems yet to be solved. Students in every institution—not just at Berkeley or Harvard, St. Olaf or Swarthmore—need to see mathematics as an active, growing discipline with challenging unsolved problems worthy of their serious attention. This applies to future scientists and engineers as well as to future mathematicians; it applies as well to future lawyers and doctors, educators and ministers. Educated people need to know that mathematics is active, and that its applications really matter.

Maintaining Intellectual Vitality

Typically, good undergraduates glimpse the frontiers of science from association with faculty research projects. However, research in mathematics is not like research in the laboratory sciences. Whereas undergraduates can become apprentice scientists in chemistry research laboratories, research in mathematics is so far removed from the undergraduate curriculum that little if any immediate benefit to the undergraduate program ever trickles down from faculty research. As a general rule, undergraduates can neither participate in nor even understand the research activity of their mathematics professors.

The key to revitalization of collegiate mathematics is a faculty that is actively engaged in scholarship and professional development far broader than traditional research. What matters is that faculty develop an environment in which students can encounter mathematics as a living, growing discipline.

Others in these hearings have argued that the crucial needs of science and engineering education are support for faculty, facilities, and instrumentation. For collegiate mathematics, I would put it differently: our need is support for faculty, faculty, and faculty. Nothing is more important to college education than a faculty that is intellectually alive: no amount of bricks, mortar, or silicon can substitute for lack of faculty energy, imagination, or will.

A rapidly advancing discipline together with steadily increasing teaching loads leave most faculty with no time for necessary professional development. But lack of time is not the only issue; so is lack of compelling professional incentive. Continued NSF emphasis on research grants rein-

forces the natural tendency of deans and tenure committees to emphasize traditional published research above almost all else as a measure of individual worth in the academic world. If we want to improve undergraduate education, we have to readjust the academic reward system to provide a better balance between research and professional development. Scholarship in the service of education builds bridges between the two fundamental missions of our educational system and leads indirectly to research of the future. In mathematics especially, we need NSF programs that build these bridges.

Suggestions for Action

First, I'd suggest a competitive system of NSF Faculty Fellowships, sufficient in number to invite large numbers of applicants and sufficiently varied in purpose to promote a wide variety of accomplishment: curriculum development, student projects, professional travel, research support, computer needs.

Second, in one move NSF could make an immediate dramatic impact on the ability of the nation's mathematics faculty to offer a challenging, modern curriculum: put a high-powered computer work station on the desk of every college and university mathematics instructor. I do not propose this as an equipment program, but as an innovative means of making an immediate and much-needed impact on faculty development. Once mathematicians have access to powerful computers, forever afterwards they will teach their students differently and more effectively.

Third, to increase leverage of limited NSF resources, take advantage of the expertise and outreach of existing professional organizations. They already have in place national networks of meetings, publications, and professional support activities, and can readily reach a majority of faculty who never have dealings with governmental agencies.

Finally, recognize that mathematics is different from science, and that undergraduate education is different from research. The relation between research and teaching in mathematics is not the same as it is in science; the role of mathematics as a foundation for science and engineering is unique; and the sheer magnitude of mathematics education (precollege and collegiate) sets it apart as distinctive. Research expertise is no guarantee of good judgment in collegiate issues, nor is experience in laboratory science a good guide for the needs of the mathematical sciences. Thus my fourth and most urgent recommendation: make sure that NSF proposal reviewers, members of advisory committees, and staff members are selected so as to provide balanced, informed advice, including appropriate numbers of individuals with substantial experience in undergraduate mathematics.

The mathematics community itself has recognized the need for coordinated action based on the recognition that mathematics is fundamental to science, that it is changing rapidly, and that is a seamless fabric from grade school to graduate school. Unfortunately, the traditional separation of education from research continues in foundation funding practices as it does in university tenure and promotion proceedings. This division is both an anachronism and an impediment at a time when the mathematical organizations themselves are working hard to bridge the gap between research and education in the mathematical sciences. The greatest contribution NSF could make to undergraduate mathematics would be to help close this gap.

Calendar

National MAA Meetings

1986 Summer Meeting, no meeting scheduled. (See "1986 International Congress of Mathematicians" on page 5 of this issue.)
70th Annual Meeting, San Antonio, Texas, January 23-25, 1987.

66th Summer Meeting, August 1987.
71st Annual Meeting, Atlanta, Georgia, January 8-10, 1988.
72nd Annual Meeting, Phoenix, Arizona, January 10-14, 1989.

Sectional MAA Meetings

Allegheny Mountain, Clarion State University, Clarion Pennsylvania, April 18-19, 1986.
Florida, Seminole Community College, Sanford, Florida, February 28-March 1, 1986.
Illinois, Augustana College, Rock Island, Illinois, April 25-26, 1986.
Intermountain and Rocky Mountain, Mesa College, Grand Junction, Colorado, April 25-26, 1986.
Iowa, University of Iowa, Iowa City, Iowa, April 11-12, 1986.
Kansas, Pittsburg State University, Pittsburg, Kansas, April 11-12, 1986.
Kentucky, Murray State University, Murray, Kentucky, April 11-12, 1986.
Metropolitan New York, Queen's College, CUNY, Flushing, New York, May 4, 1986.
Michigan, Central Michigan University, Mount Pleasant, Michigan, May 9-10, 1986.
Missouri, Southwest Missouri State University, Springfield, Missouri, April 18-19, 1986.
Nebraska, University of South Dakota, Vermillion, South Dakota, April 11-12, 1986.
New Jersey, Stevens Institute of Technology, Hoboken, New Jersey, April 26, 1986.

North Central, Inver Hills Community College, Inver Grove Heights, Minnesota, March 14-15, 1986.
Northern California, University of California-Davis, Davis, California, February 22, 1986.
Ohio, John Carroll University, University Heights, Ohio, April 25-26, 1986.
Oklahoma-Arkansas, Arkansas College, Batesville, Arkansas, March 28-29, 1986.
Pacific Northwest, Southern Oregon State College, Ashland, Oregon, June 19-21, 1986.
Rocky Mountain and Intermountain, Mesa College, Grand Junction, Colorado, April 25-26, 1986.
Seaway, Ithaca College, Ithaca, New York, April 18-19, 1986.
Southeastern, Auburn University, Auburn University, Alabama, April 11-12, 1986.
Southwestern, University of Texas at El Paso, El Paso, Texas, March, 1986.
Texas, Eastfield College, Mexquite, Texas, April 11-12, 1986.
Wisconsin, University of Wisconsin-Stout, Menomonie, Wisconsin, April 25-26, 1986.

Other Meetings

February 1986

10-14. **Seventeenth Southeastern International Conference on Combinatorics, Graph Theory and Computing**, Florida Atlantic University. Lecturers: Paul Erdös, Donald Coppersmith, Arnold Rosenberg, and Dennis Rouvray. Abstract deadline: January 28. Contact: Frederick Hoffman, Department of Mathematics, Florida Atlantic University, Boca Raton, FL 33431; (305)393-3345 or 3340.

March 1986

14-15. **Pi Mu Epsilon Student Conference**, Saint John's University. Contact: Mike Gass or Jerry Lenz, Department of Mathematics, Saint John's University, Collegeville, Minnesota 56321. (612) 363-3192 or 3193.

April 1986

2-5. **64th Annual Meeting of the National Council of Teachers of Mathematics**, Washington, D.C. There will be 495 program sessions, some sponsored jointly with the MAA. Contact: Betty Richardson, NCTM, 1906 Association Drive, Reston, VA 22091.

4-5. **Third Annual Rose-Hulman Conference on Undergraduate Mathematics**. Invited speakers: Peter Hilton, Jean Pedersen. Deadline for titles and abstracts of faculty papers: February 15; deadline for titles of student papers: March 15. Contact: Conference on Undergraduate Mathematics, Department of Mathematics, Rose-Hulman Institute of Technology, 5500 Wabash Avenue, Terre Haute, IN 47803; (812)877-1511, Ext. 391.

24-25. **Seventeenth Annual Pittsburgh Conference on Modeling and Simulation**, University of Pittsburgh. Contact: W.G. Vogt or M.H. Mickle, Modeling and Simulation Conference, 348 Benedum Engineering Hall, University of Pittsburgh, Pittsburgh, PA 15261.

June 1986

2-6. **MAA Maryland-DC-Virginia Section Summer Workshop—Mathematical Modeling**, Salisbury State College. (See page 5 of this issue.)

4-6. **Seventh National Educational Computing Conference**, San Diego, California. Contact: NECC 86, University of San Diego, School of Education, Alcala Park, San Diego, CA 92110.

9-11. **MAA Maryland-DC-Virginia Section Summer Workshop—Discrete Mathematics**, Salisbury State College. (See page 5 of this issue.)

16-20. **MAA Wisconsin Section Short Course—Algorithms of Discrete Mathematics**, Cardinal Stritch College, Milwaukee. Contact: R.J. Mihalek, Department of Mathematical Sciences, P.O. Box 413, Milwaukee, WI 53201; or Barbara Reynolds, Cardinal Stritch College, 6801 North Yates Road, Milwaukee, WI 53217.

July 1986

27-August 2. **The Eugene Strens Memorial Conference on Intuitive and Recreational Mathematics and its History**, The University of Calgary. Contact: Richard K. Guy or Bill Sands, Department of Mathematics & Statistics, The University of Calgary, 2500 University Drive N.W., Calgary, Alberta, Canada T2N 1N4.

28-August 15. **MAA Northern California Section Short Course—Computer Graphics**, California State University—Stanislaus. (See page 5 of this issue.)

August 1986

9-11. **International Congress of Mathematicians**, Berkeley, California. (See *FOCUS*, October 1985, November-December 1985, and page 5 of this issue.)