

FOCUS

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January-February 1987

Calculators with a College Education?

Thomas Tucker

The title of this article should sound familiar; it is a variation on Herbert Wilf's "The Disk with the College Education," which appeared in the MONTHLY in January, 1982. In that article, Wilf sent a "distant early-warning signal" that powerful mathematical computer environments like muMATH, which were just then becoming available on microcomputers, would someday soon appear in pocket computers. That day may have arrived. The Casio fx7000-G, introduced in early 1986, is no bigger than the usual \$10 hand calculator, but plots functions on its small dot matrix screen. This January, Hewlett-Packard will release its HP-28C; again, a normal-sized hand calculator that not only plots curves but also does matrix operations, equation-solving, numerical integration, and, last but not least, symbolic manipulation! Neither the Casio (\$55-\$90) nor the HP-28C (around \$150) are cheap by calculator standards, but any student who has bought a calculus textbook without flinching can afford a Casio and in a couple years I would expect the textbook to cause more flinching than the HP-28C. The questions these calculators raise for mathematics educators are the same Wilf asked in 1982 (after which he "beat a hasty retreat"). The answers are not any clearer today.

Here is a more detailed look at the two calculators. The Casio fx7000-G differs from other key-stroke programmable, scientific calculators by having a larger dot matrix screen that makes graphing possible and that allows the user to see clearly the expressions being evaluated. The plotter can graph many functions at once. The window (range of x - and y -coordinates) can be controlled by the user and can be easily magnified to zoom in on a particular portion of the graph. A moving pixel tracing out a given curve can be stopped at any time to specify a zooming-in point. The plotter can be used in this way to find the points of intersection of two curves. The calculator, however, has no built-in routine to solve an equation numerically, nor does it have a Simpson's rule key for numerical integration like some other scientific calculators. Since every key has three functions, the keyboard is cluttered with symbols and abbreviations.

The HP-28C does a lot more than the Casio, and it is perhaps unfair to compare them at all. It is truly the first in a new generation of calculators. Although thin enough to fit easily in a breast pocket, it folds open to reveal two keyboards. On the right
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Power to the People

Lynn A. Steen

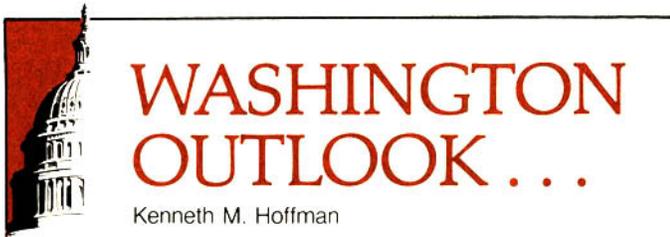
The spotlight of educational reform has shifted from school to college. Education Secretary William Bennett chides universities for inattention to students' intellectual well-being, and for "an extraordinary gap between reality and rhetoric." Ernest Boyer reports for the Carnegie Foundation on the "diminished intellectual quality" of the undergraduate experience, of conflicting priorities that weaken faculty effectiveness, and of widespread confusion over goals in undergraduate education. Bennett and Boyer express what many observers believe, that colleges and universities are troubled institutions.

Virtually all the problems with the collegiate experience are magnified within the microcosm of undergraduate mathematics. Nearly 10% of the entire undergraduate teaching effort of the nation is devoted to mathematics. Yet evidence from many sources suggests that far too often mathematics is the nadir of a student's undergraduate education. The typical American college student experiences mathematics in a large unproductive remedial course or in a skill-oriented core course taught by an inexperienced teaching assistant or an uninspired (often part-time) instructor. It is not surprising, therefore, that few students choose careers in the mathematical sciences, and that college and university administrators cite mathematics as the department about which they receive the most complaints.

Major forces are changing the context in which collegiate mathematics takes place. Computers challenge the rationale for traditional topics; new applications suggest the need for new approaches to basic courses; increased quantification in business and public policy signals the need for a more mathematically literate population.

To make matters worse, demographic data predict a rapidly developing crisis for mathematics in equality of opportunity to learn. By the year 2000, 30% of our nation's youth will be black or Hispanic, yet virtually no black or Hispanic students are currently choosing careers in mathematics or in mathematics education. Last year only 9 American blacks or Hispanics received a doctoral degree in mathematics, and only a handful of the top
(continued on page 5)

Center Section: MAA Committees



Chairman Fuqua's Legacy

When the 100th Congress convenes in January, absent will be one of the staunchest and most effective supporters of scientific research and education on Capitol Hill, Congressman Don Fuqua (D-FL). Despite some controversy surrounding Representative Fuqua near the end of his reign as Chairman of the House Committee on Science and Technology (HST), when his influence was used to land a super computer for Florida State University, we in mathematics stand deeply in his debt, as do all those of other scientific fields: He and his staff strongly supported the NSF budget increases we have received, were instrumental in helping create National Mathematics Awareness Week last year, and were the first to promulgate the encapsulation "Mathematics as a Foundation Discipline" (in remarks to the Mathematical Sciences Education Board, October, 1985).

The Chairman's retirement after 23 years in the House coincided with the final report of the Science Policy Task Force, established by HST in 1984 to focus attention on the issues involved in maintaining America's leadership in science. The lengthy report based on two years of hearings and testimony has been summarized by Rep. Fuqua and enriched by 62 specific proposal recommendations, which constitute a formidable agenda. What his successor as Chairman, likely to be Rep. Robert Roe (D-NJ), or the broader House Committee on Science and Technology will do with the recommendations remains to be seen, but they make important reading. The first three sentences convey very clearly the general message:

Science is the keystone of our nation's progress and the backbone of our military security. America's science enterprise is a national treasure and an investment in our future. Science warrants strong financial support from the Federal Government, even in times of deficit reduction.

Some of the more specific recommendations are described briefly below. Parts of the paraphrasing are taken from the National Science Foundation's monthly CONGRESSIONAL REPORT, October-November, 1986.

BASIC RESEARCH

SUPPORT—Increase Federal support for basic research to no less than 1% of the Federal budget; increase Federal support for basic research at universities to 0.2% of GNP. Create a functional multi-year authorization/appropriations mechanism to ensure continuity and stability. Grants should be of longer duration with renewal based primarily on visible, published results. Discontinue support of marginally productive researchers, and help young investigators launch their careers. Encourage the support of interdisciplinary research, supercomputers and networking, the collection of reliable data for social science research, and the exploration and production of critical and strategic materials.

BIG SCIENCE—Support by the Federal Government of big science must not be given to the exclusion of small science. Undertake those efforts that represent the most sound investment for

the nation. Order priorities and accept reasonable timetables. Consider support for the Superconducting Super Collider (SSC) only after Fermilab and the Stanford Linear Accelerator have been fully exploited and when funding is available.

PEER REVIEW—Granting agencies should reexamine policies to determine if the geographical distribution of grants is consistent with the best interests of the nation.

FEDERAL LABORATORIES—Encourage technology transfer programs and permit researchers to work on individual projects in addition to those assigned by the laboratory director. No new government laboratory should be started without closing one elsewhere.

ORGANIZATION—Remedy neglect of the basic research portion of the military R&D budget, possibly with NSF assisting DOD in expending its basic research funds. Correct the fragmented approach of categorizing, counting, and considering the totality of Federal funds designated for basic research.

REGULATION—Monitor the climate in which science is performed and ensure the public's safety in the general use of biotechnology.

INFRASTRUCTURE

FACILITIES—Minimize Congressional involvement at the project level. Address problem even if support for individual researchers has to be curtailed. A possible solution could be through programs requiring matching funds.

UNIVERSITY OPERATIONS—Develop a long-term solution for support, possibly through ancillary payments based on a fixed percentage of all direct costs, or on a formula grant system similar to that for agriculture.

UNIVERSITY SYSTEM—Foster and maintain a first-rank research university system by developing a program whereby the Department of Education and the NSF would jointly target the need for development of a new university and/or modernization of an existing one. Encourage specialization among universities to foster abilities to excel in specific areas and effectively utilize funding, facilities, and talent.

SCIENCE EDUCATION

PROGRAMS—Provide financial inducements for the best science and math students through fellowships, scholarships, and research assistantships. Provide proper storage facilities and computer capability for museums to organize material and make it available for research. Provide effective computer based instruction for all students. Determine whether the precollege educational responsibilities of NSF should be transferred to the Department of Education.

SCIENTIFIC LITERACY—Hold hearings to stimulate awareness of the importance of the scientific literacy of the general public.

CORRECTION The "Washington Outlook" column printed on page 5 of the November-December issue of FOCUS and titled "Education: National Leadership from our Community" was erroneously run over Kathleen Holmay's name instead of Kenneth M. Hoffman's name.

Mathematics Awareness Week April 12-18, 1987

The third week of April 1986 was Mathematics Awareness Week, and this tradition will continue in 1987. The national focus that was needed in 1986 to push the mathematics awareness bill through will be replaced in 1987 by multiple local efforts coordinated by Dr. Kenneth M. Hoffman, Director of Federal Relations for AMS, MAA, and SIAM together with his colleagues in Washington, D.C.

Last year, related state activities included gubernatorial proclamations of Mathematics Awareness Week, for example, by Lamar Alexander of Tennessee and the proclamation of the month of April as Mathematics Education Month by Florida's Governor Bob Graham and its legislature. Nationally, the NCTM has spotlighted mathematics education for a week in April and expanded this to a month last year. The Florida proclamation was the fruit of joint NCTM and MAA efforts that culminated in April in that state. (See FOCUS, September 1986, page i.)

Many schools, colleges, and universities took advantage of the presidentially declared Mathematics Awareness Week to sponsor local events, including lectures, contests, and open houses. By fixing Mathematics Awareness Week as the third week of April (now the NCTM's Mathematics Education Month), the larger mathematical community can make this event an institution and allow more productive long-term efforts to flourish—at the national level, the state and regional level, and the level of individual colleges, school systems, or schools.

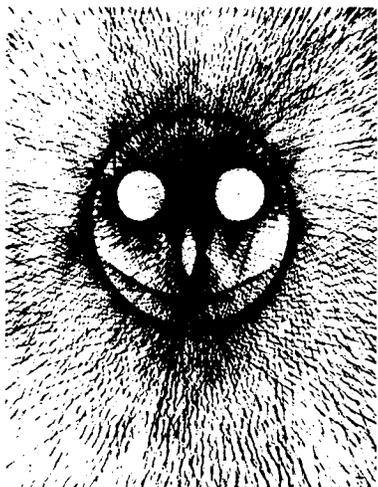
To receive press releases and information packets to help sponsor local events for Mathematics Awareness Week, write to:

Kathleen Holmay
Kathleen Holmay & Associates
2722 Washington Avenue
Chevy Chase, MD 20815

For information about legislative activities connected with this event, write to:

Dr. Kenneth Hoffman
Mathematical Association
1529 Eighteenth Street, NW
Washington, D.C. 20036

Theme: The Beauty and Challenge of a Nonlinear World.



Two images will be used in this year's campaign. This older one made by Allan M. Cormack in the 1940's illustrates ideas related to his Nobel work on CAT scanners.

The newer face of nonlinear phenomena will be a fractal that we will show later.

ICME 6, July 23–August 3, 1988

The United States Commission on Mathematical Instruction seeks to encourage American participation in the Sixth International Congress on Mathematical Education. The presentations to be made at ICME 6 are organized into Action Groups and Theme Groups as follows:

Action Groups: Early Childhood Years (ages 4-8); Elementary School (ages 7-12); Junior Secondary School (ages 11-16); Senior Secondary School (ages 15-19); Tertiary/Post-Secondary/Academic Institutions (age 18+); Pre-Service Teacher Education; Adult, Technical and Vocational Education.

Theme Groups: The Profession of Teaching; Computers and the Teaching of Mathematics; Problem Solving; Modelling and Applications; Evaluation and Assessment; The Practice of Teaching and Research in Didactics; Mathematics and other subjects; Curriculum towards the Year 2000.

For more information about submitting abstracts for consideration, send your name, mailing address, affiliation, and name of the group to which you wish to make a contribution to:

Professor Eileen L. Poiani
Chairperson
Department of Mathematics
Saint Peter's College
Jersey City, New Jersey 07306

Maryland-DC-Virginia Section Workshops on Applied Mathematics

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 twelfth year the Section has sponsored workshops on applied mathematics.

"AI, Mathematics & the Microcomputer," 8–12 June 1987, will be given by Stefan Shrier, Director of Grumman-CTEC's Research and Development. His main field of interest is machine intelligence.

"OR, Mathematics & the Microcomputer," 15–19 June 1987 will be given by J.J. Bartholdi, from the School of Industrial & Systems Engineering, Georgia Institute of Technology. His main field of interest is the efficient solution of routing and scheduling problems.

The cost, including room and board, will be \$220 for each five-day workshop. For more information, write to Dr. B.A. Fusaro, Dept. of Mathematical Sciences, Salisbury State College, Salisbury, MD 21801, or phone (301) 543-6470 or 6471.

Southeastern Conference on Combinatorics

The Eighteenth Southeastern International Conference on Combinatorics, Graph Theory and Computing will be held February 23-27, 1987 at Florida Atlantic University, Boca Raton, Florida. Instructional lecturers will be: Professors Vera Pless, Robert McElrice, Edward Assmus, Paul Erdős, Fred Roberts, and Dr. Fan R. K. Chung. There will be special emphasis on coding theory. For further information contact Frederick Hoffman, Department of Mathematics, Florida Atlantic University, Boca Raton, Florida 33431. Telephone (305) 393-3345 or 393-3340.

Allegheny Mountain Section Short Course on Game Theory

The Allegheny Mountain Section of the MAA will offer a short course June 25-28, 1987 titled Game Theory, Politics, and Public Choice. The lecturer will be Steven J. Brams, who is a Professor of Political Science at New York University. The course will be held at Allegheny College, Meadville, Pennsylvania.

Applications of game theory to politics and public choice, from voting in committees to superpower conflict, will be discussed. Although the focus of the short course will be on the applications of game theory, public choice theory, and related formal methods, revisions in the mathematical theory that facilitate modeling political conflict and cooperation will also be discussed. Topics will include: voting paradoxes and problems of representation and apportionment; analytic comparison of different election systems; rational-choice models of power, resource allocation in campaigns, and bargaining and negotiation; and game-theoretic models of arms races, deterrence, escalation, and Star Wars.

The cost will be approximately \$135 for registration, single-occupancy room, and board. For further information on the Allegheny Mountain Section short course, contact either:

Richard McDermot	or	Dave Wells
Department of Mathematics		Department of Mathematics
Allegheny College		Penn State University
Meadville, PA 16335		New Kensington, PA 15068

Oxford Course on the History of English Mathematics Offered

This summer, the course "On the Shoulders of Giants: A History of English Mathematics" will be offered at Oxford University. Lectures, aimed at a general audience, will cover the lives and contributions of some giants of English mathematics, taking a broad view of the scientific and cultural contexts of their achievements. To supplement the lectures, visits are planned to some places where these men and women lived and worked. Three undergraduate or graduate credits are available for completing this three week course, August 4-24. Professionals who take the course for credit may find this a deductible business expense.

This course is part of the 1987 Oxford University Summer Program and is sponsored by the Pennsylvania Consortium for International Education. The program provides an opportunity to study at England's oldest university, founded in 1167. Room, board, and one-day trips in conjunction with the course are all covered by the program fee of \$750. Tuition (\$204 for 3 undergraduate credits and \$267 for 3 graduate credits), airfare, and weekend meals are not included. For further information, write to the instructor: Professor Paul Wolfson, Department of Mathematical Sciences, West Chester University, West Chester, PA 19383.

BAM Takes Stock

Alfred B. Willcox

Blacks and Mathematics (BAM) is an MAA program designed to help black high school students gain entry into mathematics-related fields. Operating in 10 regions in which high schools contain high percentages of blacks, BAM provides black speakers who use mathematics in their work, organizes "BAM-Day" rallies and contests, and brings groups of students to local places of business and industry where they may see mathematics at work in society.

In its tenth year of operation, BAM is now taking a look at itself. During 1986-87, the final year of its current funding from the Department of Education, BAM will be evaluated by a three-member BAM Evaluation Group, appointed by President Steen to advise the MAA on future directions of our efforts to steer more blacks toward mathematics and fields that use mathematics.

At a recent BAM Regional Coordinators Conference in Boston, the evaluators met the BAM staff, heard discussions of plans for the 1986-87 BAM year, and began making plans for site visits to several of the BAM regions.

The Evaluation Group is part of a larger Task Force on Minorities in Mathematics, recently appointed by President Steen to advise the MAA on a broad program to increase entry of all under-represented minorities into mathematics. It is expected that the report of the Task Force will have a major influence on the Association's future activities in this area and that the BAM Evaluation Group's findings and recommendations will be important resources for the work of the Task Force.



Meeting in Boston were, l. to r., Rogers Newman (BAM Evaluation Group Chairman, MAA Governor and President of the National Association of Mathematicians), Alfred Willcox (MAA Executive Director), Gwen Mitchell (BAM Coordinator-Detroit), Royce Rosemond (BAM-Hartford), Susan Jackson (staff), Lin Darlington (BAM-Newark, NJ), Della Bell (BAM-Houston), Thomas Craft (BAM-Miami), Shirley Thompson (BAM-Newark, Assistant), Donald Hill (BAM Evaluation Group). Absent were J. Arthur Jones, the third member of the Evaluation Group and BAM coordinators Stella Ashford, James Donaldson, Samuel Douglas, and Willie Hamilton.



MAA Committee List

A full list of MAA Committees has not appeared in an MAA journal for some time. There are over eighty of these counting all standing or *ad hoc* committees and all subcommittees and editorial boards. The abbreviated list below of committees with their chairs is grouped by function. Read with President Steen's list of committee initiatives (pages 6 and 7 of this issue), this list gives a good overview of the system.

During the next year FOCUS will cover the activities of major committees within each group. For example, this issue and the previous one have covered many aspects of MAA publications. All of the work of the MAA is done directly by committees or supervised by committees. Therefore, every report of MAA activity is linked to one or more committees. The list below of committees together with a consistent editorial effort to link news, new initiatives, and this committee structure will give members a sharper understanding of how this all works. Committees do the work of the MAA, and committee participation gives members the broader perspectives of sharing perspectives and hammering out new programs with others. Committee chairs are continually in search of new potential members. Members are urged to write to the listed chairs of committees of interest to them. A note to the chair is also in order if you have information that may help the committee on questions related to the committee's work.

The committee list below provides a path to all MAA committees. Further information is available from the MAA's Washington headquarters or Section Officers. Listings of all committee members are published each year in the MATHEMATICAL SCIENCES PROFESSIONAL DIRECTORY available from the AMS, and current addresses of individuals are available in the COMBINED MEMBERSHIP LIST.

MAA Committees and Their Chairs

EXECUTIVE AND FINANCE COMMITTEES

Executive and Finance (Leonard Gillman chairs both)
 Audit and Budget (Lida K. Barrett)
 Investment (Gerald J. Porter)
 Staff and Services (Donald L. Kreider)
 Committee on Committees (Leonard Gillman)

PUBLICATIONS AND PRIZE COMMITTEES

Publications (Donald J. Albers)
 Subcommittees: Carus Monographs (Duane Bailey), Dolciani Mathematical Expositions (Joe P. Buhler), MAA Notes (William F. Lucas), MAA Studies (William F. Lucas), The New Mathematical Library (Ivan Niven), Carl B. Allendoerfer Awards (David E. Zitarelli), Lester B. Ford Awards (Stephen E. Puckette), George Polya Awards (Ann E. Watkins), Award for Distinguished Service to Mathematics (Anneli Lax), Chauvenet Prize (Theodore W. Gamelin), Bechenbach Book Prize (J. A. Seebach), Merten Hasse Prize

(Joseph D. E. Konhauser), Putnam Prize Competition (Harold M. Stark)

COMMITTEES ON THE AMERICAN MATHEMATICS COMPETITIONS

The Committee on the American Mathematics Competitions (CAMC) (Stephen B. Maurer)

Subcommittees: The American High School Mathematics Examination (Stephen B. Maurer), American Junior High School Mathematics Examination (Thomas R. Butts), American Invitational Mathematics Examination (George Berzsenyi), USA Mathematical Olympiad (Ian Richards)

COMMITTEES ON UNDERGRADUATE EDUCATION

Computers in Mathematics Education (David A. Smith)
 Mathematical Education of Teachers (Bruce E. Meserve)
 Teaching of Undergraduate Mathematics (Alan H. Schoenfeld)
 The Undergraduate Program in Mathematics (CUPM) (Jerome A. Goldstein)

Subcommittees of CUPM: Joint CUPM-CTYC-AMATYC Subcommittee on the Curriculum at Two-Year Colleges (Ronald M. Davis), Joint CUPM-CTUM Subcommittee on Service Courses (Donald W. Bushaw)

OTHER STANDING COMMITTEES

The Archives of American Mathematics (Sanford L. Segal)
 Development (Eileen L. Poiani)
 Placement Examinations (COPE) (John W. Kenelly)
 Secondary School Lecturers (Allen H. Holmes)
 Sections (David W. Ballew)
 Public Information Panel (Yousef Alavi)
 Two-Year Colleges (Ann E. Watkins)
 Visiting Lecturers (Jon M. Laible)

NOMINATING COMMITTEES

For 1987 (Gerald L. Alexanderson)
 For the Treasurer for 1988-1992 (Ivan Niven)
 For Editor of the COLLEGE MATHEMATICS JOURNAL (Doris Schattschneider)

PROGRAM AND MEETING COMMITTEES

Meetings (John M. Smith)
 Hedrick Lecturers (Ivan Niven)
 Minicourses (John O. Riedl)
 AMS-MAA Joint Meetings Committee (Everett Pitcher [AMS] and Kenneth A. Ross [MAA])

OTHER JOINT COMMITTEES

ACM-MAA Committee on Retraining for Computer Science (Donald L. Kreider)
 AAAS-AMS-MAA Committee on Opportunities for Disadvantaged Groups (Gloria Gilmer)

The Publications Committee from Bottom to Top

As retiring chairman of the Publications Committee, Alan Tucker offered these insights on the rewards of his work. He learned the importance of active and critical reading from Ray Fulkerson, his thesis advisor. Fulkerson's passionate concern and meticulous care inspired like qualities in Tucker.

For Tucker, the heart of Publications is the Series Subcommittees. Here he cut his editorial teeth reading the details of articles in Ash's MAA Studies Volume on that subject—demanding and rewarding material far outside of Tucker's specialty of graph theory. In addition to work on the Studies, Tucker helped launch the MAA Notes Series, brought in the Engel book on algorithms, and helped advance many other projects.

As chairman, he had an overview, seeing many manuscripts at early stages and steering the project and author in the appropriate direction. He noted that judgment and diplomacy must go hand in hand in this job because weak projects must be rejected—with constructive comments, if possible—early in order not to overburden the subcommittees—and it is these subcommittees that are at working edge of Publications. Tucker's concern for subcommittee members (and authors) stems from knowing how demanding their work is and from a deep personal appreciation of how rewarding it is to do all of this work well.

The reader may be interested to know that Tucker's father and grandfather were MAA presidents and that Tucker is Chairman of Applied Mathematics at SUNY—Stony Brook, an author and editor, and outgoing Chairman of the Committee on Publications.

Publications Committee Seeks Even Broader Participation

Donald J. Albers

Publications are the Association's lifeblood. We can point with pride to our books, journals, and newsletter. More than 100 members currently serve on the Committee on Publications and its eight subcommittees, and on editorial boards. As we move toward the 90's, we need more help from more members. In particular, our book program needs your help. Specifically, we are asking you to:

- Suggest new book ideas and names of prospective authors. Your suggestions should be made to the chairs or members of the appropriate subcommittee series (The Carus Monographs, The New Mathematical Library, The Dolciani Mathematical Expositions, MAA Notes, and Studies in Mathematics). Contact the Chairman of the Committee on Publications, Don Albers, with ideas about potential projects lying outside the scope of our usual series.
- Let us know about new book manuscripts. If you have a manuscript that seems right for the MAA, then contact the appropriate series chair.
- Inform prospective authors that it's a good idea to publish with the MAA. The colored dot-points give some reasons.
- Your book will get excellent exposure to your primary constituency via special mailings to members of MAA, AMS, and NCTM—a pool of over 100,000 individuals. In addition, we reach bookstores here and abroad and sell books at national and regional meetings.

- MAA books stay in print longer than those of other publishers. The MAA's first Carus Monograph by Gilbert Ames Bliss, was published more than sixty years ago and is in print today.
- As an MAA author, you will be joining distinguished company: Bliss, Eves, Honsberger, Niven, and Polya. . .
- MAA royalty rates are competitive with other publishers.
- No editorial operation outside of the MAA's Committee on Publications and its series subcommittees combines this ability to understand the mathematics with a deep commitment to clear and exciting exposition. Each MAA book benefits from the constructive guidance of this group, with its mixture of experienced hands and new talent.
- MAA books are produced to high standards, and the Association is ready to meet the illustration, marketing, and other needs of new or unusual projects. The Committee's marketing and production effort is backed by Elaine Pedriera's considerable experience at the MAA and by the new Associate Director, Dr. Peter Renz, who brings over ten year's of experience in publishing to the job.
- Tell us what you think of MAA books and how you use them. Such information keeps the Committee on course. Suggestions passed on to authors help correct errors and direct revisions. We know some MAA books are used as class supplements, texts, as prizes in mathematical competitions, in addition to serving as professional or pleasure reading for members.
- Bring your favorite MAA books to the attention of your students, colleagues, and your library.

If publications are the lifeblood of the Association, then the series subcommittees of the Committee on Publications are its heart. As mentioned earlier, these subcommittees want your ideas on new books and prospective authors in addition to any comments or suggestions you may have about current books. The names and addresses of the chairs of series subcommittees are as follows:

CARUS MONOGRAPHS: Professor Duane Bailey, Department of Mathematics, Amherst College, Amherst, MA 01002

DOLCIANI MATHEMATICAL EXPOSITIONS: Professor Joe Buhler, Mathematical Sciences Research Institute, 1000 Centennial Drive, Berkeley, CA 94707, until June 15, then at Reed College.

THE NEW MATHEMATICAL LIBRARY: Professor Ivan Niven, Department of Mathematics, University of Oregon, Eugene, OR 97403

MAA NOTES and MAA STUDIES IN MATHEMATICS: Professor William F. Lucas, 1589 Beloit, Claremont CA 91711

The Purpose of MAA Books In the Preface to his 1925 Carus Monograph, *THE CALCULUS OF VARIATIONS*, Gilbert Ames Bliss wrote, "The purpose of the monographs is to make the essential features of various mathematical theories accessible and attractive to many persons. . .". Mrs. Carus identified a wider purpose of contributing to "exact knowledge and clear thinking, not only for mathematicians and teachers of mathematics but also for other scientists and the public at large." How well the Association continues to meet these goals can be judged by Ian Stewart's review of *RANDOM WALKS AND ELECTRICAL NETWORKS* by Peter G. Doyle and J. Laurie Snell, reprinted in *FOCUS*, November-December 1986, page i.

Donald J. Albers is the incoming Chairman of the Committee on Publications.

FOCUS EMPLOYMENT ADVERTISEMENTS

Rates for FOCUS Employment Ads are:

- 50 words or less: \$25.00
- More than 50 words: \$30.00 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 **first** occurrence specified in the contract.

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 submission in the March-April issue is March 1.

POSITION ANNOUNCEMENT

East Central University
Department of Mathematics
Ada, Oklahoma 74820

Tenure-track position in mathematics beginning in August, 1987. A Ph.D. is preferred. Duties include teaching 27 hours over two semesters of undergraduate mathematics at the freshman through senior levels. Rank and salary will be commensurate with qualifications. Send a copy of graduate and undergraduate transcripts and three letters of recommendation addressed to Dr. Ray Hamlett, at the above address, not later than March 15, 1987. East Central University is an Equal Opportunity, affirmative action employer.

Department of Mathematics Southern Oregon State College Ashland, OR 97520

The Mathematics Department has two permanent teaching positions for the 1987-88 academic year. Doctorate in mathematics required. One position is in applied mathematics; the other may be any speciality with preference given to discrete mathematics and/or geometry. Applicants must have a strong commitment to teaching undergraduate mathematics and have the equivalent of 1 year of college-level teaching experience. Send application by March 1, 1987, to: Dr. Ronald Steffani, Chair, Mathematics Department. SOSC is an AA/EEO employer.

WAYLAND BAPTIST UNIVERSITY Plainview, Texas 79072

Permanent position to begin Fall, 1987. An earned doctorate in mathematics is required. The person selected will have a strong Christian commitment with a student-oriented attitude and offer excellence at all levels of undergraduate teaching. A background in computer science would be desirable. A course load consists of 12 credit hours per semester, plus summer if desired. Wayland is a four-year, liberal arts, multipurpose school of 1900 (950 in off-campus center, including Alaska and Hawaii). Send three letters of recommendation, transcripts, and curriculum vitae to Dr. J. Hoyt Bowers, Chairman, Mathematics and Science Division, Wayland Baptist University, Plainview, TX 79072. WBU is an AA/EO employer.

DEPARTMENT OF MATHEMATICS BOISE STATE UNIVERSITY

Tenure-track position starting August 20, 1987, rank and salary dependent upon qualifications. Ph.D. required. Applicants expected to teach normal range of undergraduate mathematics courses, average teaching load is 12 hours per semester. Applicants in all areas of mathematics are encouraged to apply. Send letter of application, resume, graduate transcripts, and 3 letters of reference to: Dr. Charles Kerr, Chair/Department of Mathematics, Boise State University, 1910 University Drive, Boise, ID 83725. Screening will begin on February 1, 1987 and continue until the position is filled. The BSU Mathematics Dept. offers a Bachelor's in mathematics and in mathematics for secondary education, computer science option is being sought. EEO/AA Institution.

MATHEMATICS AND COMPUTER SCIENCE DEPARTMENT FRANCIS MARION COLLEGE FLORENCE, SOUTH CAROLINA 29501

In computer science—tenure-track, Rank open—based on qualifications and experience. M.S. in computer science required; doctorate and teaching experience preferred. Responsibilities include teaching a full range of undergraduate computer science courses.

In mathematics—tenure-track, Assistant Professor. Ph.D. in mathematics required; teaching experience preferred; some computer science experience preferred but not mandatory. Responsibilities include teaching undergraduate mathematics courses at and above the calculus level.

In mathematics—2 Temporary Instructors. Master's degree in mathematics required and some teaching experience required. Responsibilities include teaching freshman and sophomore courses primarily in the self-paced mode. Appointment for one year, possibly for renewal twice, for a maximum of three years.

Send VITA, 3 letters of recommendation, and transcripts to Dr. James T. Ramey (for the C.S. position) or Dr. Roger W. Allen, Jr. (for the math positions) at the address above.

TENNESSEE TECHNOLOGICAL UNIVERSITY DEPARTMENT OF MATHEMATICS

Applications are invited for a tenure-track position at the Assistant or Associate Professor level, beginning September 1, 1987. The Department is especially interested in finding someone who can contribute to our program in applied mathematics for graduate mathematics and engineering students. However, qualified applicants in all areas are encouraged to apply. Candidates must have a Ph.D. in mathematics, statistics or a related area; a strong commitment to excellence in teaching at both the undergraduate and the graduate levels; and a serious interest in research and scholarly activity.

To apply, send a letter of application, a curriculum vitae (which includes citizenship and/or visa status), and a transcript of graduate work to:

Alice Mason, Chairman
Department of Mathematics
Box 5054, TTU
Cookeville, TN 38505.

Applicants should also arrange to have at least three (3) letters of recommendation sent to the above address.

Applications will be reviewed immediately upon completion and will continue to be accepted until the position is filled. Tennessee Technological University is an AA/EEO Employer.

**DEPARTMENT OF MATHEMATICS
NORTHERN ARIZONA UNIVERSITY**

The Department of Mathematics is seeking candidates for two tenure-track positions starting August 24, 1987. Qualifications include a Ph.D. in mathematics or mathematical statistics, evidence of teaching effectiveness and potential for an active mathematical research program. The first position is at the assistant professor level and preference will be given first to qualified candidates in statistics and second to those in combinatorial algebra or geometry, or qualitative theory of differential equations. The other position, at the assistant or associate professor level, requires a specialty in combinatorial algebra or geometry, qualitative theory of differential equations or geometric topology. NAU is located in Flagstaff, Arizona amidst pine forests at an altitude of 7000 feet in the mountains of Northern Arizona. The department is committed to the pursuit of excellence in its instructional and research programs. Send resume and direct three letters of recommendation to: Screening Committee, Department of Mathematics, Box 5717, Northern Arizona University, Flagstaff, AZ 86011. The search will remain open until the positions are filled; however, the screening committee will begin reviewing applications on February 16, 1987. NAU is an Equal Opportunity/Affirmative Action Institution. Women and minorities are encouraged to apply.

**INDIANA UNIVERSITY AT KOKOMO
KOKOMO, IN 46902**

Tenure-track assistant professorship beginning 8/87. 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 Sciences. Applications received by Feb. 27 are assured of consideration. Equal opportunity/Affirmative Action Employer.

**DEPARTMENT OF MATHEMATICS
California State University, Chico
Assistant Professor of Mathematics**

The Department of Mathematics is seeking a specialist in mathematics education to fill a full-time tenure-track position beginning Fall, 1987.

A Ph.D. or Ed.D. in Mathematics Education, with a strong background in mathematics and evidence of teaching excellence, is required. Duties include teaching undergraduate mathematics courses, preparing and implementing grant applications in mathematics education, and carrying out scholarly research in mathematics education. The salary range is \$25,812-\$31,044.

Qualified candidates should submit a resume, transcripts, supporting documents, and at least three letters of recommendation to:

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

The closing date for applications is February 1, 1987. CSU, Chico is an Equal Opportunity, Affirmative Action employer.

**DEPARTMENT OF MATHEMATICS
California State University, Chico
Assistant Professor of Mathematics**

The Department of Mathematics at California State University, Chico is seeking a specialist in applied mathematics for

a full-time tenure-track position beginning Fall, 1987.

A Ph.D. in Mathematics and the potential for teaching excellence are required. Duties include teaching undergraduate mathematics courses, developing and teaching courses in applied mathematics and mathematical modeling, and carrying out scholarly research. The salary range is \$25,812-\$31,044.

Qualified candidates should submit a resume, transcripts, supporting documents, and at least three letters of recommendation to:

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

The closing date for applications is February 1, 1987. CSU, Chico is an Equal Opportunity, Affirmative Action employer.

**DEPARTMENT OF MATHEMATICS
California State University, Chico
Assistant Professor, Associate Professor, or Professor of
Mathematics**

The Department of Mathematics at California State University, Chico is seeking mathematicians or statisticians for one or more one-year temporary leave replacement positions beginning Fall, 1987. A Ph.D. in Mathematics or Statistics and evidence of teaching excellence are required. The salary is \$25,812-\$49,548. Duties include teaching undergraduate mathematics courses and carrying out scholarly research.

Qualified candidates should submit a resume, transcripts, supporting documents, and at least three letters of recommendation to:

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

The closing date for applications is March 15, 1987. CSU, Chico is an Equal Opportunity, Affirmative Action employer.

SUNY COLLEGE AT BROCKPORT

Tenure-track assistant/associate professorship in Mathematics anticipated September 1987. Applicants should have a Ph.D. in Mathematics with expertise in Discrete Mathematics, Probability, Applied Mathematics, or Operations Research, and a strong commitment to the teaching of Mathematics at the Undergraduate and Masters' level. For more information, 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 6 to the Office of Faculty/Staff Relations, SUNY College at Brockport, Brockport, NY 14420. EO/AEE

SUNY COLLEGE AT BROCKPORT

Tenure-track position in Computer Science available September 1987. 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, Microprocessors, Networking, or Computer Graphics. 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 to the Office of Faculty/Staff Relations, SUNY College at Brockport, Brockport, NY 14420. EO/AEE

**GRAND VALLEY STATE COLLEGE
ALLENDALE, MICHIGAN**

Tenure-track positions in Mathematics and Computer Science:

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

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

For each position, duties include teaching, curriculum development, student advising and professional development. GVSC is located just west of Grand Rapids; the second largest metropolitan area in Michigan and offers numerous cultural and recreational opportunities. Cost of living is moderate and quality of life is high. Salary: Commensurate with experience; good fringe benefits. Send complete resume to: Dr. Donald W. VanderJagt, Chairman, Math & C.S. Dept., Grand Valley State College, Allendale, MI 49401. An EO/AA Institution.

**TRINITY COLLEGE
Hartford, Connecticut 06106
Department of Mathematics**

The Department of Mathematics at Trinity College invites applications for a tenure-track position at the rank of Assistant Professor, to begin in the academic year 1987-88.

The requirements for the position are a Ph.D. in one of the mathematical sciences and demonstrated excellence as a teacher. Applicants with any specialty will be considered; however, we are especially interested in those with a specialty in: complex analysis, differential equations, numerical analysis, applied mathematics, or computer science.

The normal teaching load is 5 courses per year (two semesters).

Trinity College is an Equal Opportunity/Affirmative Action employer. Applications from members of groups affected by affirmative action guidelines are invited.

Applicants should submit a detailed curriculum vitae, an academic record, and at least three letters of reference to:

D. A. Robbins, Chairman
Department of Mathematics
Trinity College
Hartford, CT 06106

Applications should be received by 30 January 1987; all applicants will be acknowledged.

Representatives of the Department will be at the AMS meeting in January.

UNIV OF MICHIGAN, DEARBORN, DEPT OF MATH & STAT, DEARBORN, MICHIGAN 48128. The U of M-Dbn plans to fill two (or possibly more) tenure-track positions starting in Sept. 1987. One is at the Asst. Prof. level and requires a Ph.D. in Mathematics, with research interest in an applied area preferred. Teaching capability in an applied area or in computer science is also a plus for this position. The other position, possibly carrying Assoc. Prof. rank, is in Computer Science, with a Ph.D. in Mathematics acceptable. A research interest in Computer Science is preferred for this position; some teaching capability in mathematics is required. The teaching load is 9 credit hours per term. To apply, send resume and have 3 letters of recommendation sent to Ronald Morash, Chairman, Search Committee. The Univ of Mich-Dbn is an Equal Opportunity Employer and specifically invites and encourages applications from Women and Minorities.

MATHEMATICS/COMPUTER SCIENCE

GETTYSBURG COLLEGE invites applications for a tenure-track, assistant professor position to teach mathematics and computer science starting September 1987. Completion of a Ph.D. in mathematics and a commitment both to excellence in teaching and to continued research are essential. Preference will be given to those applicants with a masters in computer science or equivalent background. Salary is competitive.

Gettysburg College is a selective liberal arts college historically related to the Lutheran Church in America. The college has approximately 1800 students and a student-faculty ratio of 13:1. The normal teaching load is three courses per semester on an early semester calendar. Extensive computing facilities include a Burroughs 5920 and microcomputer laboratory. The town of Gettysburg is in south-central Pennsylvania with proximity to Baltimore and Washington, D.C.

Send resume and three letters of reference to David E. Flesner, Department of Mathematics, Gettysburg College, Gettysburg, PA 17325. To insure consideration, submit application by February 15, 1987. Gettysburg College is an Equal Opportunity/Affirmative Action Employer; women and minorities are encouraged to apply.

**UNIVERSITY OF NORTH CAROLINA AT CHARLOTTE
DEPARTMENT OF MATHEMATICS, CHARLOTTE, NC 28223**

Possible positions as Lecturer in Mathematics. One or two year renewable non-tenure-track appointment. MA/MS in mathematics or equivalent required. Duties include teaching 12 hours of lower-division mathematics courses per semester. Preference given to candidates who can teach sophomore-level courses. To apply, send vita and transcripts to Prof. Evan G. Houston, Chairman, Faculty of North Carolina at Charlotte, Charlotte, NC 28223, and arrange to have 4 letters of recommendation, specifically addressed to Prof. Joseph E. Quinn, Chairman, Department of Mathematics, sent to the same address. Closing date: March 30, 1987 and every two weeks thereafter until positions are filled. UNCC IS AN EQUAL OPPORTUNITY EMPLOYER.

**Linfield College
Department of Mathematics**

Tenure-track position open at the Assistant or beginning Associate Professor level for September 1, 1987. Responsibilities include teaching full range of lower division courses including occasional upper division courses in discrete mathematics and modern and linear algebra. Seek strong commitment to undergraduate teaching and the liberal arts tradition with continuing interest in professional achievement beyond teaching. Ph.D. in mathematics or the equivalent preferred; ABD status will be considered. Send letter of application, resume, three letters of recommendation, and transcripts to Kenneth P. Goodrich, Dean of Faculty, Linfield College, McMinnville, Oregon 97128. Screening begins 15 January 1987. Applications from women and minority group members encouraged. Equal opportunity/affirmative action employer.

**Department of Mathematics
Ohio University
Athens, Ohio 45701**

The Department of Mathematics anticipates the appointment of two tenure-track assistant/associate professors beginning September 1, 1987. Salary will be competitive. Duties include research and teaching at the undergraduate and graduate level. Applicants must have a Ph.D. in Mathematics, be a U.S. citizen or have a permanent visa, and have research interests

compatible with the current faculty in algebra, analysis, differential equations, or topology. For the associate professor position only exceptionally well-qualified individuals will be considered.

Send resume and have three letters of recommendation sent to Shih-liang Wen, Chairman, Department of Mathematics, Ohio University, Athens, Ohio 45701. The deadline for applications is January 31, 1987.

Ohio University is an Equal Opportunity and Affirmative Action Employer.

**STERLING COLLEGE
MATHEMATICS DEPARTMENT
STERLING, KANSAS 67579**

Assistant or Associate Professor to teach a wide range of courses in an undergraduate Applied Mathematics program. Ability to teach General Physics desirable. Doctorate preferred. Sterling College is affiliated with the Presbyterian Church (USA) and desires faculty who value teaching within a Christian context. Send letters of application, resume, transcripts to Dr. Richard Walker, Academic Dean, Sterling College, Sterling, Kansas, 67579. Sterling College is an Equal Opportunity Employer.

**UNIVERSITY OF SOUTH CAROLINA
Department of Mathematics**

Applications are invited for tenure-track faculty positions at all levels. Applications in all areas of mathematics will be considered; the Department particularly wishes to strengthen its programs in applied and computational mathematics. The Ph.D. degree or its equivalent is required, and all appointments will be consistent with the Department's commitment to excellence in research and teaching at both the undergraduate and graduate levels. Faculty research is strongly supported through funding for visitors and travel, and excellent library and computing facilities. The Department operates its own computation center (VAX 8300 and 11/750); terminals installed in each faculty office provide access to the VAX complex and to the University's IBM 3081 mainframes and FPS 264 array processor. 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.

**ST. MARY'S UNIVERSITY
DEPARTMENT OF MATHEMATICS
SAN ANTONIO, TEXAS 78284**

Tenure-track faculty position in mathematics available. Rank/salary dependent upon qualifications. Ph.D. in mathematics required. Applicants should have the ability/desire to develop a new Bachelor's Degree Program in mathematical sciences incorporating mathematical modeling, statistics, and use of the computer in problem solving. Usual teaching load is 12 hrs/wk. Send application letter, vita and three (3) letters of reference to Bro. D Brisendine, Chairman. Deadline: Feb. 15, 1987; then monthly until May 1987.

**KENYON COLLEGE MATHEMATICS DEPARTMENT
GAMBIER, OH 43022**

Tenure-track position starting 87-88. Entry level AsstProf, but candidates with some experience can be considered. Must

have PhD by 8/87. Must have broad background in math. Preference for candidates in prob/stats or applications. Good background in CS or combinatorics or modeling is an asset. Strong commitment to undergrad teaching and scholarship is required. Teach 3 courses per sem. Send vita, transcripts, and three letters of reference (at least one regarding teaching) to Stephen Slack at above address. Call (614) 427-2244 Ext2267 for info. Send info by Jan 1 to help make an interview at AMS meeting in Jan more useful. Deadline is Feb 8, 1987. Kenyon is an EOE.

**KENYON COLLEGE MATHEMATICS DEPARTMENT
GAMBIER, OH 43022**

Tenure-track position starting 87-88. Senior AsstProf or beginning AssocProf level. Must have PhD. Must have broad background in math. Preference for math applications. Background in CS or combinatorics or modeling or prob/stats is an asset. Strong commitment to undergrad teaching and scholarship is required. Teach 3 courses/sem. Send vita, transcripts, and three letters of reference (at least one regarding teaching) to Stephen Slack at above address. Call (614) 427-2244 Ext2267 for info. Send info by Jan 1 to help make an interview at AMS meeting in Jan more useful. Deadline is Feb 8, 1987. Kenyon is an EOE.

UNIVERSITY OF BRIDGEPORT

Tenure-track position at the Instructor/Asst. Prof. level available beginning Sept 1987. Duties include coordinating, advising and teaching 3 courses/semester in the University's Basic Studies Program. Doctorate preferred, masters required; doctorate necessary for tenure. We seek someone who has the interest and ability to work with remedial students. Salary/benefits competitive. Send resume, including the names of three references to Louis M. Friedler, Chair, Dept of Math, U. Bridgeport, CT 06601 by Feb. 1, 1987. UB is an Equal Opportunity/Affirmative Action Employer.

APPALACHIAN STATE UNIVERSITY. MATHEMATICS EDUCATION: Tenure-track position beginning August, 1987. Appalachian State University is a member of the University of North Carolina system with an enrollment of 10,000. The department of Mathematical Sciences is housed in the College of Arts and Sciences; department includes Computer Science, Statistics, Pure and Applied Mathematics, and Mathematics Education; approximately 350 majors; M.A. programs in mathematics and mathematics education. A commitment to teaching mandatory; scholarly activity is expected and research is encouraged. Doctorate in Mathematics Education or in a Mathematical Science with expertise in Teacher Education is preferred. Teaching assignments to include undergraduate and graduate mathematics courses for elementary and secondary teachers and general undergraduate courses in Mathematics. 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, NC 28608. Completed application must be received by March 15, 1987. ASU is an Equal Opportunity Employer.

APPALACHIAN STATE UNIVERSITY. COMPUTER SCIENCE: Tenure-track position beginning August 1987. 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; depart-

ment includes Mathematics, Computer Science, Statistics, Applied Mathematics and Mathematics Education; approximately 350 majors; strong master's degree program; micro labs, and labs with mainframe terminals are maintained within the department; well equipped faculty work stations; primary emphasis on teaching but research is encouraged; 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 March 15, 1987. ASU is an Equal Opportunity Employer.

**Department of Mathematical Sciences
Hiram College, Hiram, Ohio**

The department is soliciting candidates for a tenure-track position in mathematics. Some experience in statistics and/or computers is desired, but not required. Candidates should have a Ph.D. in mathematics or statistics and should be committed to undergraduate teaching. The usual fringe benefits are available and the salary will depend upon background and experience. Write: Dr. Oberta Slotterbeck, Department of Mathematical Sciences, Hiram College, Hiram, OH 44234.

**The University of Scranton
Dept. of Mathematics/Computer Science**

The University of Scranton is a Jesuit university with over 3500 undergraduates. At least one tenure-track position is available in Fall 1987 for faculty interested in a teaching environment. Individuals with expertise in any area of mathematics or computer science will be considered. Research is encouraged and supported through a strong faculty development program. Rank and salary are open and competitive. The department currently has 19 full-time faculty and about 400 majors. The University has a campus-wide commitment to computing including a faculty PC purchase program. Submit a vita, transcripts and three references to: Mathematics/Computer Science Search Committee, University of Scranton, Scranton, PA 18510 or phone (717) 961-7774. An AA/EO Employer and Educator

**Mathematics Department
California State University
Northridge, California 91330**

Three tenure-track positions are available. Requirements are a Ph.D. in Mathematics, evidence of teaching excellence, and research activity in one of the following fields: analysis, applied mathematics, foundations of mathematics, or mathematics education. Applications will be considered for appointment at the assistant, associate, or full professor rank. Salary range: \$25,811 to \$49,546. Starting date for all position is August 31, 1987. Send a cover letter and resume by February 1, 1987 to D.H. Potts, Chair, Department of Mathematics, California State University, Northridge, California, 91330. California State University is an Equal Opportunity, Affirmative-Action Handicapped Title IX Employer.

**UNIVERSITY OF NORTH DAKOTA
Department of Mathematics
Grand Forks, North Dakota 58202**

Applications invited for tenure-track position at Assistant Professor level starting 8/16/87. Areas considered are statis-

tics or math education. Ph.D. in Statistics (or Mathematics with stat concentration) or Math Education is required. Must possess strong commitment to teaching and an interest in research. Teaching load is three courses per semester. Salary competitive. Open until filled. Send resume, copy of transcripts and three names of reference to Selection Committee. UND is an AA/EOE.

COMPUTER SCIENCE FACULTY—Applications are invited for a tenure-track faculty position in Computer Science with duties commencing in August of 1987. Rank and salary are dependent on qualifications. Ph.D. in Computer Science is preferred. Applicants holding a Ph.D. in mathematics or a related field and having a strong interest in computer science will be considered. Potential for growth as a computer scientist is required. Duties will include teaching undergraduate and graduate students and research.

Please indicate your visa status when applying to: Dr. William A. Welsh, Jr., Head, Division of Science, Engineering and Technology, c/o Robert H. Hamill, Business Office, Box MAA, The Pennsylvania State University at Harrisburg, The Capital College, Middletown, PA 17057. Position open until filled.

The Pennsylvania State University at Harrisburg is an upper division college and graduate center located 8 miles southeast of the state capital at Harrisburg.

AN AFFIRMATIVE ACTION/EQUAL OPPORTUNITY EMPLOYER.

**MATHEMATICS POSITION—WIDENER UNIVERSITY
CHESTER, PENNSYLVANIA 19013**

The Department of Mathematics anticipates an open tenure-track position at the rank of assistant professor. Duties would begin September 1, 1987. Applicants should have a Ph.D. in Mathematics and a strong interest in teaching undergraduates. Preference will be given to candidates whose background would enable them to teach sophomore-level discrete mathematics and to interact with the computer science program. The teaching load is three four-hour courses per semester. Applicants should send a cover letter and resume with the names of three references to: Dr. Theodore J. O'Tanyi, Division Head of Science, Widener University, Chester, PA 19013

Anticipated vacancies, Instructor/Assistant Professor (two positions) for Fall 1987. Master's degree or Ph.D. in Mathematics, Ph.D. preferred. For full consideration candidates with a commitment to excellence in teaching and scholarly activity should send resume, transcripts, and three letters of recommendation to Dr. Carlton Molette, Dean, College of Arts and Sciences, Lincoln University, Jefferson City, MO 65101 on or before February 27, 1987. An Equal Opportunity/Affirmative Action Employer.

**CONNECTICUT COLLEGE
NEW LONDON, CONNECTICUT**

We invite applications for an Assistant Professorship from individuals committed to scholarship and teaching. Connecticut College is a very selective, coeducational, private, liberal arts institution (1600 students) located on Long Island Sound, midway between New York City and Boston. Two-year renewable appointment. Ph.D. required. Teaching comprises introductory and advanced courses in mathematics and some computer science. Send resume and 3 letters of recommendation to: E. C. Schlesinger, Acting Chairperson, Mathematics Department, Box 1566, Connecticut College, New London, CT 06320. Women and Minorities are encouraged to apply. Equal Opportunity Employer.

AUGSBURG COLLEGE
Minneapolis, MN 55454

Dedicated to quality mathematics teaching at exciting liberal arts college in heart of dynamic city? Tenure-track position opens 9/87. Send letter of intent, resume, and evidence of excellent teaching ability (perhaps letters) to Larry Copes, Chair, Department of Mathematics. Augsburg is an EOE.

TRINITY UNIVERSITY invites applications and nominations for a tenure-track position in Mathematics at the rank of Assistant Professor, appointment beginning August, 1987. Responsibilities include teaching nine credit hours per semester, continuing scholarly activity, assisting in curriculum development as appropriate to the needs of the department and the University, interacting in a creative way with other departments and programs, advising and the usual committee service.

Minimum qualifications are the Ph.D. in Mathematics, Applied Mathematics or Operations Research with excellence in and strong commitment to teaching. All fields will be considered with preference given to candidates in Discrete Mathematics or Algebra.

Founded in 1869, Trinity University occupies a modern campus overlooking the San Antonio skyline. Purposely small and selective, with about 2700 students, Trinity stresses a high quality, undergraduate liberal arts and science program. San Antonio is a city of approximately 850,000 people situated in a Metropolitan area of 1.2 million.

Send vita, transcripts and three letters of reference to Donald F. Bailey, Chmn, Department of Mathematics, Trinity University, San Antonio, Texas, 78284. Closing date for applications is February 16, 1987.

TRINITY UNIVERSITY IS AN EQUAL OPPORTUNITY, AFFIRMATIVE ACTION EMPLOYER.

HAMILTON COLLEGE
Dept. of Mathematics & Computer Science
Clinton, NY 13323

Two-year tenure track position. Ph.D. required; three years prior teaching experience desirable. Six courses per year at a small, highly selective, 4-year liberal arts college. Excellence in teaching and continued scholarly activity required. To apply send curriculum vitae and three letters of reference to Larry Knop, Chair. Women and members of minorities are encouraged to apply; Hamilton College is an Equal Opportunity Employer.

TEACHING FACULTY
MATHEMATICS
RHODE ISLAND COLLEGE

To teach mathematics (and mathematics education, if qualified), do scholarly work, participate in committee work including curriculum development and student advisement. Tenure line appointment anticipated Fall, 1987. Requires Ph.D. in mathematics, or doctorate in mathematics education with sufficient math background to teach a wide variety of math courses at all levels. Salary \$20-29,000. Attractive fringes. Summer employment available. Rhode Island College is a pleasant, modern, conveniently located campus; an institutional member of MAA, ACM and committed to high quality teaching, research and program development. APPLICATIONS MUST BE RECEIVED BY 4:00 P.M. ON MONDAY, MARCH 2, 1987. Send resume, transcripts, and three current letters of reference to: Chair, Mathematics and Computer Science Department, Rhode Island College, Providence, RI 02908. An Affirmative Action/Equal Opportunity Employer

TEACHING FACULTY
MATH/COMPUTER SCIENCE
RHODE ISLAND COLLEGE

To teach mathematics and/or computer science, do scholarly work, participate in committee work including curriculum development and student advisement. Tenure line position anticipated Fall, 1987. Requires Ph.D. in Math with ability to teach a variety of computer science courses, or Ph.D. in Computer Science. [Applicants with Master's and teaching experience will be considered for a 3 year term appointment.] Salary and rank competitive, commensurate with qualifications. Attractive fringes. Summer employment available. Rhode Island College is an institutional member of the ACM, MAA, and committed to high quality teaching, research, and program development. APPLICATIONS MUST BE RECEIVED BY 4:00 P.M. ON MONDAY, MARCH 23, 1987. Send resume, transcripts, and three letters of reference to: Chair, Math/Computer Science Dept., Rhode Island College, Providence, RI 02908.

An Affirmative Action/Equal Opportunity Employer

MATHEMATICS DEPARTMENT

Indiana University of Pennsylvania invites applications for a permanent tenure-track position at the Assistant/Associate Professor rank in Mathematics, beginning September, 1987. Duties are to teach undergraduate and graduate courses with emphasis on courses in Operations Research or Applied Mathematics, to provide leadership in the implementation of a newly designed M.S. program in Applied Mathematics, to give direction to a graduate internship program and to graduate student projects in Applied Mathematics, and to participate in other academic and professional activities of the department and the discipline. A Ph.D. in an Applied Mathematics field or a Ph.D. in Mathematics with experience in Operations Research or Applied Statistics is required. Teaching and/or field experience preferred, but not required. Review of applications will begin on January 10, 1987, and continue until the position is filled. Send letter of application along with resume and the names, addresses, and phone numbers of three references to Search Committee A, Department of Mathematics, Indiana University of Pennsylvania, Indiana, PA 15705. IUP is an affirmative action/equal opportunity employer.

FACULTY POSITION: MATHEMATICS

The University of Pittsburgh at Johnstown announces a tenure-track position in Mathematics at the Assistant or Associate Professor level for September 1, 1987. Applicants should have a background in statistics and/or quantitative science. A long-term commitment and interest in teaching all levels of undergraduate mathematics as well as a strong motivation for continuing professional development are expected. A doctorate in mathematics or a related discipline, or evidence of completing all requirements for a doctorate by Spring, 1987, is required. Academic year is from September 1 to April 30 with limited spring or summer teaching. Salary and rank are negotiable and dependent on experience and academic qualifications. Application deadline: April 2, 1987, or later, until the position is filled. Send resume and supporting documents to Dr. Ildefonso T. Cruz, Search Coordinator, Department of Mathematics, University of Pittsburgh at Johnstown, PA 15904.

UPJ is an Equal Opportunity/Affirmative Action Employer.

DENISON UNIVERSITY

A tenurable position at the Assistant Professor level in the Department of Mathematical Sciences for 1987-88. A Ph.D. in one of the mathematical sciences (mathematics, computer science, and statistics) and a strong background in computer

science is required. A commitment to quality instruction of undergraduates is essential. The primary responsibility of this position is teaching (mainly in computer science) and some research. The teaching load is three courses per semester with limited responsibilities during January Term. 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.

Denison's computing facilities consist of a VAX 11/780, a VAX 11/785, 20 DECIMATE II word processors, 20 DEC Rainbow full-color microcomputers, and 152 terminals, about 100 of which are dedicated to a student body of 2,100. Students have 24-hour access to most terminals which are distributed among classroom buildings and living units. In addition to the general university resources, the department has a laboratory equipped with six UNIX PC's and a 16-user AT&T 3B2/400 computer and a classroom/laboratory facility with 21 IBM-PC equivalents connected through another 3B2/400. Send resume and appropriate transcripts to Professor Zaven A. Karian, Chairman, Department of Mathematical Sciences, Denison University, Granville, OH 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, 1987. Applications beyond this date will be considered until the position is filled. Denison is an Affirmative Action/Equal Opportunity Employer.

U.S. NAVAL ACADEMY
Department of Mathematics

Applications are invited for several tenure-track appointments at the rank of Assistant or Associate Professor commencing in January or August of 1987. The initial salary will be competitive and commensurate with experience and qualifications. Research opportunities exist for augmenting salary during the summer intersessional period. Specialization in applied mathematics or operations research is of particular interest. Applicants must possess an earned Ph.D. by the date of appointment, have a commitment to excellence in teaching, and be capable of pursuing an independent program of research. Inquiries and applications should be sent to Prof. J. M. D'Archangelo, Mathematics Department, U.S. Naval Academy, Annapolis, MD 21402-5002. Required of all applicants are a resume, transcripts of academic records, and at least three letters of recommendation from persons familiar with the applicant's teaching and research. Interviews will be conducted at the annual AMS/MAA meeting in San Antonio in January. The Naval Academy is an EO/AA employer.

LUTHER COLLEGE, DEPARTMENT OF MATHEMATICS, DECORAH, IOWA 52101. TENURE-ELIGIBLE POSITION AT INSTRUCTOR OR ASSISTANT PROFESSOR RANK STARTING SEPTEMBER 1987. Qualifications: Ph.D. or ABD in mathematics. Duties: Teach three classes in mathematics each semester, plus one class in three out of four January terms. Salary: competitive, generous fringe benefits. Closing date is February 20, 1987. Credentials received after this date will be considered if the position has not been filled. Send dossier and 3 letters of reference to: Dr. Donald Pilgrim, Head, Mathematics Department, Luther College, Decorah, Iowa 52101. Phone: 319/387-1173. An EO employer.

ST. CLOUD STATE UNIVERSITY
ST. CLOUD, MN 56301

The Department of Mathematics and Statistics invites applications for four tenure-track positions to begin Sept. 9, 1987. One position requires specialization in mathematics education, the other positions are open to all areas of specialization. Applicants must have a commitment to undergraduate education, excellent teaching credentials, and a record of scholarly and professional activity. A doctorate is preferred, but ABD's are encouraged to apply. Send resume, graduate transcripts, and three letters of reference to Gail Earles, Chairperson by 2/15/87. SCSU is an equal opportunity employer.

AGNES SCOTT COLLEGE
Department of Mathematics
Decatur, Georgia 30030

Metro-Atlanta area liberal arts college for women, with a strong four-year program in mathematics, has a tenure-track position at the assistant professor level starting fall of 1987. Necessary are a Ph.D. in mathematics and a strong commitment to teaching in an undergraduate liberal arts college. Applicants with some experience in computer science and interest in developing additional offerings are preferred. Professional activity is encouraged; college support is available. Send vita, transcripts and three letters of recommendation to Robert Leslie, Chair, by February 10, 1987. Applications considered until the position is filled.

Anticipated Vacancy in
Math/Computer Science

Adams State College announces an anticipated regular track vacancy in math/computer science starting 8/27/87. Teach intro and advanced math and intro computer science courses. M.A. in mathematics with formal coursework in computer science required. Successful experience in teaching math and computer science courses preferred. Desirable attributes include familiarity with 8088/8086 family of computers, high levels of energy, and teaching enthusiasm. Send letter of application, resume including citizenship status, official copies of all transcripts, and 3 letters of reference to Ron Loser, Adams State College, Alamosa, CO 81102. Complete applications will be considered beginning April 3, 1987, and continue until vacancy is filled.

Tenure-track position, Fall 87. Rank/Salary commensurate with experience. Ph.D. in Mathematics required; specialty open. (Advanced ABD considered). Will teach a variety of elementary and advanced undergraduate courses. Scholarship expected and encouraged. Send application and 3 letters of reference to: Dr. G. C. Mangano, Mathematics Search Committee, Utica College of Syracuse University, Utica, NY, 13502. Closing date: 2/15/87. AA/EOE

LAMAR UNIVERSITY, DEPARTMENT OF MATHEMATICS
BOX 10047, BEAUMONT, TX 77710

The Department of Mathematics of Lamar University invites nominations and applicants for a Department Head, starting August 25, 1987. Minimal qualifications include a Ph.D. in Mathematics or Mathematical Sciences and a record of professional accomplishments. Administrative experience is desirable. Salary commensurate with experience. Send a detailed resume and 3 letters of recommendation to: Dr. J. R. Hopper, Chairman of Search Committee. Deadline for applications: February 15, 1987. (Subsequent deadlines at 30 day intervals thereafter until position is filled.) An Affirmative Action/Equal Opportunity Employer.

King's College has an opening in a tenure-track position in Mathematics for the Fall 1987 semester at the Assistant Professor level. Applicants should have a Ph.D. in mathematics, a commitment to quality teaching, and an interest in formally training young mathematicians. The position consists primarily of teaching twelve (12) hours per week of undergraduate mathematics classes. This normally would include at least one advanced offering. The salary and fringe benefits are competitive with those of similar undergraduate colleges. King's College is an independent four-year College founded by the Congregation of Holy Cross Fathers. Send application, including resume, three letters of reference and transcripts to: Dr. D. W. Farmer, Academic Dean, King's College, Wilkes-Barre, PA 18711.

King's College is an Equal Opportunity Employer.

VALDOSTA STATE COLLEGE

Four tenure-track positions beginning Fall, 1987: (3) in mathematics at the Asst./Assoc. Prof. level and one in C.S. at the rank of Asst. Prof. Ph.D. required for math positions with special consideration given to applicants in algebra, probability or statistics, operations research, numerical methods, and applied math. Candidates for C.S. position should have a Ph.D. in C.S. Preferred areas: operating systems, data communications, software engineering, data base management, data structures, artificial intelligence. Applicants for either position should have a commitment to excellence in teaching and continued scholarly activity. Send vita to: John W. Schleusner, Head, Department of Mathematics and Computer Science, VSC, Valdosta, Georgia 31698. Application deadline is March 20, 1987. VSC is an AA/EEOE.

CALIFORNIA STATE UNIVERSITY, LONG BEACH

Four tenure-track positions, Fall 1987: (1) Numerical Analysis; (2) Applied PDE (preferred) or Operator Theory; (3) Algebra, Analysis or Topology with preference to specialties matching faculty interests; (4) Math. Education, with grant writing experience and interests in geometry, history of math or computer applications. Asst. or Assoc. Prof. preferred, Professor possible for senior applicants with distinguished records in teaching and research. Ph.D. in Mathematics required for (1)-(3), acceptable for (4); Ph.D. in Math. Ed. preferred for (4). Must be U.S. citizen or permanent resident prior to appointment. Applicants in other specialties or without permanent residence may be considered for temporary appointment as Lecturer; Ph.D. in Math required. Evidence of teaching excellence and strong research potential required. Normal teaching load 3-4 courses, 12 hrs. per week. Positions open until filled, but selection begins Dec. 1 from applicants with complete files (resume, transcript, 3 reference letters). Send to C. W. Austin, Chairman, Math. & Comp. Sci., CSU, Long Beach, CA 90840.

CSULB is an Affirmative Action/Equal Opportunity Employer.

INSTRUCTOR WRIGHT STATE UNIVERSITY DEPARTMENT OF MATHEMATICS AND STATISTICS DAYTON, OHIO 45435

Several instructorships are anticipated for Fall 1987. These are one year non-tenure track positions which may be renewed annually for up to five years. These positions offer competitive salaries and excellent benefits. The teaching load is 12-15 contact hours per quarter, mainly in service courses. Master's degree in mathematics or statistics required. Previous full-time teaching experience preferred. Please send resume, graduate transcript(s) and three letters of reference to: Faculty Search Committee. Closing date: February 15, 1987, then every two weeks until selection or August 1, 1987. WSU is an AA/EEOE.

DEPARTMENT OF MATHEMATICS UNIVERSITY OF WISCONSIN-EAU CLAIRE

At least two tenure-track faculty positions. All specialties considered with some preference to those in algebra or geometry who are interested in teaching upper-level undergraduate courses in those areas, as well as other entry-level courses. Doctorate strongly preferred. Twelve-hour teaching load in a primarily undergraduate teaching institution which has graduate programs for teachers and which actively encourages research and scholarly activities. Applicants must present evidence of potential for excellence in teaching. One- or two-year initial appointment. Closing date for applications: February 15, 1987, 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. University of Wisconsin-Eau Claire is an equal opportunity, affirmative action employer.

CHRISTIAN BROTHERS COLLEGE

The Department of Mathematics and Computer Science invites applications for 2 tenure track positions. Applicants should possess a Ph.D. in Mathematics or Computer Science and have a strong commitment to teaching. Applicants with a Master's degree in Computer Science will be considered. Women and minorities are encouraged to apply. Christian Brothers College is a four-year Catholic college located in Memphis, Tennessee. With a day enrollment of approximately 1200, the college offers baccalaureate degrees in 24 areas in Business, Engineering, Mathematics, Sciences and Liberal Arts; the college has recently opened its Center for the Study of Telecommunications. Starting date is late August, 1987; the deadline for application is March 15, 1987. Applicants should forward vita and arrange for transcripts and three letters of recommendation to be sent to Dr. Lawrence J. Gulde, Head, Department of Mathematics and Computer Science, Christian Brothers College, 650 East Parkway South, Memphis, Tennessee 38104, (901) 278-0100. AA/EEOE

UNIVERSITY OF WISCONSIN-OSHKOSH DEPARTMENT OF MATHEMATICS

The Department of Mathematics at the University of Wisconsin-Oshkosh anticipates having one or more entry level tenure-track positions beginning September, 1987. The primary responsibility is undergraduate teaching with the usual teaching load being 12 credits per semester. Scholarly activity and departmental committee work are expected. Grant writing is encouraged. Good teaching is essential! Candidates should have a Ph.D. or anticipate completing a Ph.D. by September 1987. All areas of specialization, including mathematics education will be considered. Send application letter, vita, a complete set of transcripts and three letters of recommendation to: Dr. Norbert J. Kuenzi, Chair, Department of Mathematics, University of Wisconsin-Oshkosh, Oshkosh, WI 54901. Screening of candidates will begin February 2, 1987. The University of Wisconsin-Oshkosh is an Affirmative Action Equal Opportunity Employer.

WASHINGTON STATE UNIVERSITY PURE & APPLIED MATHEMATICS PULLMAN, WASHINGTON 99164-2930

The Department of Pure and Applied Mathematics has at least two openings, one tenure-track and one temporary

position, starting August 1987. Applicants for the tenure-track position should have a Ph.D. with active research interests in COMPUTATIONAL MATHEMATICS, NUMERICAL ANALYSIS or OPERATIONS RESEARCH/COMBINATORIAL OPTIMIZATION. The area of research is more open for the temporary position. The University is an equal opportunity/affirmative action employer. Applications from members of minority groups, women, and handicapped persons are encouraged. Screening of applicants will begin February 15, 1987. Vita and three (3) letters of reference should be sent to: Professor Duane W. DeTemple, Chairman, Search Committee.

**ILLINOIS BENEDICTINE COLLEGE
MATHEMATICAL SCIENCES DEPARTMENT
LISLE, ILLINOIS 60532**

Illinois Benedictine College invites applicants for a tenure-track position in mathematics for fall, 1987. Applicants should hold the Ph.D. in mathematics. Interest in research and teaching preferred in areas related to modern algebra, number theory, geometry. Summer teaching available under separate contract.

Illinois Benedictine College is a selective, liberal arts, coeducational college with 40 math majors and five full time faculty. Contact Phyllis M. Kittel, Ph.D. 312-960-1500 extension 561.

MATHEMATICS DEPARTMENT

Indiana University of Pennsylvania invites applications for a permanent tenure-track position at the Assistant/Associate Professor rank in Mathematics, beginning September, 1987. Duties are to teach 12 semester hours of undergraduate and graduate courses per semester, to assist in course and curriculum revision, to advise students and to serve on faculty committees, and to participate in other academic and professional activities of the department. A doctorate (or degree nearing completion) is required. Some background in applied mathematics preferred but not required. Teaching experience is preferred. Review of applications will begin on January 10, 1987, and continue until the position is filled. Send letter of application along with resume and the names, addresses, and phone numbers of three references to Search Committee B, Department of Mathematics, Indiana University of Pennsylvania, Indiana, PA 15705. IUP is an affirmative action/equal opportunity employer.

**Potsdam College
of the STATE UNIVERSITY OF NEW YORK
Department of Mathematics**

The Department of Mathematics invites applications for a full time, tenure-track position as Assistant Professor commencing August 1987. Responsibilities: Teach 12 hours of undergraduate and beginning graduate courses. Qualifications: Ph.D. in any area of Mathematics and evidence of excellent teaching skills. Salary approximately \$26,000 minimum. Send letter of application, resume, graduate transcripts and letters of reference to: Dr. C. L. Smith, Chairman, Search Committee, Mathematics Department, Potsdam College, Potsdam, New York 13676. Review of applications will commence February 1, 1987 and continue until the position is filled. Women and Minorities are encouraged to apply. An Equal Opportunity/Affirmative Action Employer.

**GUSTAVUS ADOLPHUS COLLEGE
MATHEMATICS/COMPUTER SCIENCE DEPARTMENT
ST. PETER, MINNESOTA 56082**

Tenure-Track Position at Assistant Professor rank, beginning September 1987. Ph.D. or nearly. Applied Mathematics preferred. Teaching duties are 3 courses per semester and 1 course in 2 out of 3 January Terms. Salary, fringe benefits competitive. Please send letter of application, resume, transcripts, and 3 recent letters of reference to Dr. Ron Rietz, Chair, Mathematics/Computer Science Department, Gustavus Adolphus College, St. Peter, MN 56082. Phone (507) 931-7483, or -7007. Deadline: February 10, 1987. GAC is an EO/AA employer.

COMPUTER SCIENCE FACULTY POSITION

The Computer Science Program at Oberlin College invites applications for a full-time, continuing faculty position in the College of Arts and Sciences. The position, which has been authorized for an initial term of 4 years, beginning July 1, 1987, will carry a rank and salary commensurate with experience and qualifications.

The incumbent will teach courses in the general area of Computer Science, including at least one course in the appointee's area of specialization. In addition, he or she will have the opportunity to work with students in the Honors Program in Computer Science and will be expected to maintain a scholarly research program.

Among the qualifications required for appointment is the Ph.D. degree in hand or expected by September 1987. Candidates must demonstrate interest and potential excellence in undergraduate teaching. Previous experience as a teacher is desirable.

The appointee will participate fully in the newly established major program in Computer Science which currently has an authorized staff size of four faculty positions. Oberlin offers an innovative Computer Science Major rooted in the liberal arts model curriculum, with some emphasis towards symbolic programming and artificial intelligence. A VAX 11/750 running UNIX with a full 8 megabytes of main memory and 431 megabytes of disk storage is dedicated to the computer science program. Additional software available on this system include two Scheme systems, Prolog, Concurrent Euclid and Maple. Other computer facilities at Oberlin include two VAX 11/780's for general academic computing and a VAX 8600 for administrative work. Access to CSNet and Bitnet is anticipated to begin during the current academic year.

Oberlin is a highly selective coeducational college of arts and sciences. In comparison with other primarily undergraduate colleges, Oberlin has an extraordinarily strong record in producing students who have gone on to earn Ph.D. degrees in science and mathematics.

To be assured of consideration, letters of application, including a curriculum vitae, academic transcripts, and at least three letters of reference, should be sent to George Andrews, Director, Computer Science Program, Oberlin College, Oberlin, Ohio 44074 by February 23, 1987. Application materials received after that date may be considered until the position is filled.

The Mathematics and Computer Science Department of the State University of New York College at Fredonia, an undergraduate liberal arts institution, seeks for the fall of 1987 candidates with a Ph.D. in Mathematics for tenure-track positions. The department has 14 Ph.D.'s with a diverse range of mathematical specialties and interests. Successful candidates must exhibit a strong commitment to teaching and will be required to do some research. Rank and salary will be commensurate with qualifications and experience. Candi-

dates should send a resume and three letters of reference to:

Professor Albert D. Polimeni
Department of Mathematics and Computer Science
State University of New York College at Fredonia
Fredonia, New York 14063

Deadline: February 15, 1987. An equal opportunity, affirmative action employer.

**DEPARTMENT OF MATHEMATICS AND COMPUTER
SCIENCE
AIR FORCE INSTITUTE OF TECHNOLOGY**

The Department of Mathematics and Computer Science invites applications for a tenure-track appointment at the assistant or associate professor level depending upon qualifications. This GM-1520-13 position is in the excepted civil service, with a 12 month salary of \$37,599. The incumbent teaches graduate and advanced graduate courses in applied mathematics, mathematical analysis and/or computer science or statistics which form parts of accredited master's and doctoral degree programs in the School of Engineering. In addition, the incumbent performs research and provides authoritative consultation to other units of the Air Force. A doctorate in mathematics or in a closely related field is highly desired, and evidence of achievement or potential in research and teaching is required. Applicants must be U.S. citizens. Contance Dean Lynn E. Wolaver, AFIT/ENC, Wright-Patterson AFB OH 45433-6583, telephone (513) 255-3098 for additional information about the position or to recommend potential candidates.

To apply, submit vita, Standard Form 171, (Application for Federal Employment) and transcripts to: 2750 ABW/DPCFE, ATTN: P-86-17(65), Wright-Patterson AFB OH 45433-5000, telephone (513) 257-8305. Applications must be post-marked before midnight, 27 February 1987. WRIGHT-PATTERSON AFB IS AN EQUAL OPPORTUNITY EMPLOYER.

**MILLERSVILLE UNIVERSITY
OF PENNSYLVANIA**

**Department of Mathematics
and Computer Science**

Applications are invited for several full-time tenure-track and temporary positions in mathematics beginning September, 1987. Teaching loads are 24 semester hours per year; released time for research is available on a competitive basis. Candidates must hold the Ph.D. degree in mathematics and a strong commitment to excellence in teaching and scholarship. Strength in probability and statistics is required for one of the tenure-track positions; interest and applied areas of mathematics is preferred for another. Candidates with any mathematical specialty will be considered. Rank and salary will be determined by qualifications and experience; salaries range from \$21,951 to \$43,461 with excellent benefits.

The department consists of 26 full-time faculty serving approximately 175 mathematics majors and 350 computer science majors. Mathematical specialties among the faculty include statistics, algebraic topology, real & complex analysis, algebra, differential equations, graph theory and combinatorics. Millersville University maintains several VAX and IBM mainframe computer systems including a VAX-11/750 with ULTRIX and an IBM 4361 running VM/CMS. A VAX and ETHERNET network is expected to be available by Fall, 1987. The department maintains a VAX-11/730, a PDP-11, and numerous microcomputers.

Millersville University enrolls more than 7,000 students and is located near Lancaster, PA, well-known for its rich agriculture, natural beauty, agreeable climate, and safe, pleasant life-style. Send vita, transcripts and three letters of recommendation (at least one of which attests to your teaching effectiveness) to: **Dr. Charles G. Denlinger, Search Committee Chairman, Dept. of Math & C.S., Millersville University, Millersville, PA 17551.** Interviews begin on or about January 15, 1987. Millersville University is an Equal Opportunity Employer.

**AIR FORCE INSTITUTE OF TECHNOLOGY
SCHOOL OF ENGINEERING
HEAD, DEPARTMENT OF MATHEMATICS AND COMPUTER
SCIENCE**

Applications and nominations are invited for the position of Head of the Department of Mathematics and Computer Science at the Air Force Institute of Technology. Candidates should have a Ph.D. in mathematics, applied mathematics, statistics or computer science and be qualified for appointment at the rank of full professor. The candidate must have a sound research and publication record, graduate level teaching experience and a clear capacity for graduate education administration. U.S. citizenship is required.

The appointee is expected to provide strong leadership in teaching and research, along with consulting support to Air Force laboratories and organizations. In addition to its own graduate program in applied mathematics, the Department provides applied mathematics, analysis, statistics, and computer science support for the Institute. The Department currently has 18 full time faculty members.

The Air Force Institute of Technology, School of Engineering, in which the Department resides, is among the largest in the country in annual number of engineering graduate degrees awarded. Current enrollment is over 700 graduate students, of which approximately 45 are at the doctoral level.

This GM-1520-15 position is in the excepted civil service, with a 12 month salary range of \$52,262 to \$67,940 commensurate with experience and qualifications. Applicants should submit a resume, with a list of publications, Standard Form 171 and transcripts to 1750 ABW/DPCFE, P-86-19(65), Wright-Patterson AFB OH 45433-5000, telephone, 513-257-8305. Applications must be post-marked not later than midnight, 27 February 1987. A search committee will review applications and recommend candidates for final selection. Contact Dean Lynn E. Wolaver, for additional information about the position or to recommend potential candidates. WRIGHT-PATTERSON AIR FORCE BASE IS AN EQUAL OPPORTUNITY EMPLOYER.

The South Dakota School of Mines and Technology's Mathematics and Computer Science Department invites applications for a tenure-track position, starting in August, 1987. Responsibilities include teaching primarily undergraduate core courses in Computer Science and Applied Mathematics. The Department offers B.S. and M.S. degrees in Computer Science and a B.S. degree in Mathematics. SDSM&T is a state supported college emphasizing engineering and science.

A Ph.D. in either Mathematics, Statistics or Computer Science and a commitment to teaching are required. Preference will be given to someone with training and/or experience in more than one area. Rank and salary are commensurate with qualifications. Selection will begin on February 15, 1987 and applications will be accepted until the position is filled.

Send resume and three letters of reference to: Dr. Karen Whitehead, Acting Head, Department of Mathematics and Computer Science, South Dakota School of Mines and Technology, 501 E. St. Joe, Rapid City, SD 57701. SDSM&T is an EO/AA employer.

SAINT PETER'S COLLEGE

The Department of Mathematics invites applications for a full-time position to begin in the Fall of 1987. A Ph.D. or a Master's with significant progress toward a Ph.D. is required. Applicants must have a strong interest in teaching undergraduates in an urban setting. Some preference will be given to applicants with a background in statistics or operations research. Please send a resume and three current letters of

reference to L.E. Thomas, Mathematics Department, Saint Peter's College, Jersey City, NJ, 07306, by February 15, 1987. SPC is an AA/EOE.

EMORY UNIVERSITY

Department of Mathematics and Computer Science

The Department of Mathematics and Computer Science has at least two openings at the level of tenure-track assistant professor or higher, in the case of exceptional candidates. Applicants must have a Ph.D. and a strong record (or promise) of research, and should be committed to teaching as well. We are particularly interested in the following areas:

- geometric analysis;
- algebra;
- numerical analysis, preferably numerical solution of differential equations.

Applications are encouraged, however, from candidates with strong research credentials in any area of mathematics or computer science.

The department presently has 20 permanent members comprising several active research groups, the largest of which are in differential equations and in combinatorics. Our graduate program offers the Ph.D. in mathematics and master's degrees in mathematics and computer science. Teaching will include graduate and undergraduate courses; we offer no remedial courses. Salaries are competitive and commensurate with experience.

Please reply by Jan. 31, 1987 to: Prof. Peter Winkler, Dept. of Math. and C.S., Emory University, Atlanta, GA 30322. Include a vita and 3 references; please have reference letters forwarded to us.

Emory University is an equal opportunity/affirmative action employer.

CALVIN COLLEGE

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

The Calvin College Department of Mathematics and Computer Science will have tenure-track openings and possibly temporary openings for the 1987-88 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.

Mathematics: Kutztown University announces two tenure-track positions in mathematics. Applicants must have a background in either pure or applied mathematics. The department offers both a B.A. and a B.S. in mathematics, a B.S. in secondary education, and M.A. in mathematics and a mathematics specialization in a Master or Education program. In addition, the department offers a B.S. in computer and information science and is seeking approval of a Master's of Science degree program in computer science. Research and instructional facilities include a Burroughs A9 mainframe; several high-performance graphics terminals; an M68000-based multi-user, dual-processor microcomputer; and several well-equipped microcomputer laboratories. A Ph.D. in mathematics is preferred; however, candidates with a strong Master's degree will be considered. Candidates are expected to participate in curriculum development, student advisement, at the graduate and undergraduate level, teach basic

service mathematics courses as well as advanced undergraduate and graduate courses. Rank and salary are commensurate with qualifications. Starting date is September 1987. Applications, including graduate transcripts and three letters of recommendation, should be sent to Dr. Larry Mugridge, Dept. of Mathematics and Computer Science, Kutztown University, Kutztown, PA 19530. Deadline for applications is February 15, 1987. Kutztown University is an Affirmative Action/Equal Opportunity Employer and actively solicits application from qualified minority and women applicants.

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 experience preferred. Review of applications will begin on Nov. 10, 1986 and continue until the position is filled. Send letter of application and resume to:

Director of Personnel
MOHAWK VALLEY COMMUNITY COLLEGE
1101 Sherman Drive
Utica, New York 13501

Equal Opportunity Employer M/F.

THE COLLEGE OF WOOSTER MATHEMATICAL SCIENCES DEPT. Wooster, Ohio 44691

The College of Wooster seeks to fill two tenure-track positions for the Fall, 1987 at the assistant professor level. To teach elementary and advanced courses in mathematics, direct senior independent study, and participate in interdisciplinary courses. Support for research available. Salary competitive. Ph.D. in mathematics required, specialty open. Review of applications will begin February 15, 1987 and continue until the positions are filled. The College also has a one-year visiting position in mathematics, Ph.D. preferred. Send vita, transcripts, and 3 letters of recommendation to Charles R. Hampton, Chairperson, at the address above. The College of Wooster wishes to insure that the search identifies qualified candidates who are women or members of minorities. Applicants belonging to these groups are encouraged to identify themselves if they wish. The College is an Equal Opportunity, Affirmative Action Employer.

TWO MATHEMATICS POSITIONS Franklin and Marshall College Lancaster, PA 17604-3003

Two entry level, tenure-track positions as assistant professors of mathematics are available starting in the Fall of 1987. A Ph.D. is expected by the starting date. Applicants should exhibit interest and some experience in teaching undergraduates. Whereas primary research interest may be in any field in the mathematical sciences, candidates able to teach courses in statistics or computer science will be given special consideration. Teaching responsibilities will be three courses per semester.

Applicants should submit a resume, transcripts, and three letters of recommendation to W. F. Tyndall, Department of Mathematics and Astronomy, by February 1, 1987. Franklin and Marshall College, a coeducational liberal arts college, is an Equal Opportunity Employer.

NORTHERN KENTUCKY UNIVERSITY

The Department of Mathematical Sciences, Northern Kentucky University invites applications for the position of chairperson to lead 26 full-time and 18 part-time faculty members.

The department offers undergraduate degrees in mathematics, computer science, and mathematics education, with growing offerings in statistics. The department emphasizes excellence in undergraduate instruction in hiring, promotion, and tenure decisions. Northern Kentucky University, founded in 1968, has a student body of 9000, and is located just 7 miles from downtown Cincinnati, Ohio. Greater Cincinnati, with its rich cultural heritage, is an excellent place to live. Candidates must have an earned doctorate in one of the mathematical sciences or computer science, a strong undergraduate teaching record and demonstrated academic leadership. Applicants should submit a curriculum vitae and three letters of recommendation to: Daniel Curtin, Chair, Search Committee, Department of Mathematical Sciences, Northern Kentucky University, Highland Heights, KY 41076. Review of applications will begin February 1, 1987 and continue until the position is filled. The anticipated appointment date is July 1, 1987. Northern Kentucky University is an Affirmative Action/Equal Opportunity Employer and actively seeks the candidacy of minorities and women.

URSINUS COLLEGE

Anticipated opening, Dept. of Math. and Comp. Sci., Fall 1987. Tenure-track position at the Asst. Prof. level. Ph.D. desired and required for tenure. Salary open. Twelve hours per week teaching load, full range of courses in the mathematical sciences. Good teaching references essential. Standard fringe benefits. Send application and 3 letters of recommendation to John W. Shuck, Chairman, Dept. of Math. and Comp. Sci., Ursinus College, Collegeville, PA. 19426. An Equal Opportunity Employer.

Mathematics Department Chairperson Department of Mathematics Illinois State University

The Department of Mathematics at Illinois State University invites applications for the position of Chairperson. The appointment will be made at the rank of Professor. The salary is competitive. Duties will begin on or about July 1, 1987.

Qualifications—Applicants must have a Ph.D. in Mathematics or Mathematics Education and a solid record of achievement in research, teaching, and leadership. They must have demonstrated effective administrative skills and a strong commitment to mathematics, applied mathematics, statistics, and mathematics education. Experience with graduate programs is desirable.

The Department—The ISU Department of Mathematics has 42 full-time faculty positions and offers undergraduate, masters, and Doctor of Arts programs, with opportunities in both mathematics and mathematics education. A Ph.D. in Mathematics Education is currently being developed. Current faculty research interests include analysis, combinatorics, graph theory, number theory, statistics, and various areas of mathematics education. The department serves over 4000 students each semester.

Application Procedures—To ensure consideration applicants should send, before February 15, 1987, a letter of application, a complete vita, a transcript, and names and addresses of at least 3 references to: Mathematics Chair Search Committee; % Professor Larry Alferink, Department of Psychology; Illinois State University; Normal, Illinois; 61761.

Illinois State University is an Equal Opportunity/Affirmative Action, Employer.

So. Illinois U. at Edwardsville Mathematics and Statistics Edwardsville, Illinois 62026-1653

SIUE, a state university 20 miles from downtown St. Louis, Mo., invites applications for positions in three areas—3 assist. prof. in Math., one each assist/assoc. prof. in Stat. and in Math. Ed.—beginning Sept. 1987. Only applicants who have a doctorate, or equivalent experience, or will complete Ph.D. requirements by Sept. 1, 1987, will be considered. We seek applicants with excellent research accomplishments/potential and a strong commitment to teaching. For the Math. Ed. position, preference will be given to applicants with experience in the common schools who could work effectively with area school on mathematics education at the elementary and middle school levels and work with relevant local, state, and federal agencies. Salary is competitive (\$24,000-32,000), based on qualifications and experience. Direct inquiries to Mathematics Search, Math. Ed. Search, or Statistics Search Committee as appropriate. SIUE is an AA/EEO Employer.



CHAIR DEPARTMENT OF MATHEMATICS

ROSE-HULMAN INSTITUTE OF TECHNOLOGY POSITION AVAILABLE BEGINNING 1 JULY 1987.

Interested in chairing the mathematics department at a college of science and engineering where teaching, advising and professional development are really important? If so, perhaps Rose-Hulman is for you.

- 1300 well-qualified and highly motivated undergraduates
No remedial courses (Entry level course is calculus)
Median SAT Scores - Mathematics - 670 (97th%ile nationally)
and Verbal - 540 (93rd%ile nationally)
- 130 National Merit Scholars (in top ten in the nation per capita)
- Nationally ranked Putnam team
- Undergraduate mathematics students presented over 25 papers in the last five years
- Twelve active (writing, research, consulting) full time faculty members with interest and expertise in mathematics, operations research, and statistics

Candidates should have an appropriate (mathematics, operations research, statistics) earned doctorate, administrative potential, a record of scholarly activity, and excellence in teaching. Responsibilities include scheduling classes, budgeting, recruiting, making promotion, tenure and retention recommendations, and teaching two courses per quarter.

To apply, send a letter of application, a curriculum vita, and the names, addresses, and telephone numbers of at least three people who are willing to serve as references for you, to:

Dr. James R. Eifert, Dean of Faculty and Vice President of Academic Affairs, Rose-Hulman Institute of Technology, Terre Haute, IN 47803.

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

FACULTY APPOINTMENTS

The Department of Mathematical Sciences at The Johns Hopkins University invites applications for junior (tenure-track) and senior (tenured) appointments, effective Fall 1987, in the area of operations research, broadly defined. Specializations of particular interest include (but are not limited to) decision science, mathematical programming, network flows, combinatorial optimization, algorithms, numerical methods, discrete mathematics, and large-scale systems. Candidates should be active researchers having outstanding accomplishments or demonstrated potential in research, teaching and/or innovative applications. Interested persons are asked to send their vitas to:

Professor Robert J. Serfling, Chairman
Department of Mathematical Sciences
The Johns Hopkins University
Baltimore, Maryland 21218

Junior applicants are asked also to write describing their professional interests and aspirations, and to have three letters of reference sent; recent or new Ph.D.'s are asked also to furnish official university transcripts.

The Johns Hopkins University is an Equal Opportunity/Affirmative Action Employer. Employment is offered without discrimination on the basis of race, color, religion, sex or national origin.

**ALLEGHENY COLLEGE
DEPARTMENT OF MATHEMATICS
MEADVILLE, PA 16335**

Tenure-track positions in an expanding department are available beginning in September 1987. Applicants should have a Ph.D. in mathematics and strong commitments to the teaching of undergraduate students and to continued professional development. Rank and salary are competitive and commensurate with qualifications and experience. Fringe benefits include TIAA-CREF, health and life insurance, full tuition benefits for family, and IBM PC's in faculty offices. There may also be a sabbatic replacement position open to persons with at least a Master's degree and teaching experience.

Screening of applicants will begin December 1, and continue until all positions are filled. Send application, graduate transcripts, and three letters of recommendation to Ronald E. Harrell, Search Committee Chairperson. Early applicants should also indicate whether they plan to attend the Joint Mathematics Meetings in San Antonio. Allegheny College is an Equal Opportunity Employer.

**Head, Department of Mathematics
Northeast Louisiana University**

Tenure-track appointment beginning July 1, 1987. Faculty of 18 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: March 1, 1987.

Apply to:

Dr. Daniel E. Dupree, Dean College of Pure and Applied Sciences Northeast Louisiana University Monroe, LA 71209

**WHEATON COLLEGE
Wheaton, IL 60187**

A tenure-track position in mathematics is available beginning August 1987. A Ph.D. in mathematics and ability to teach effectively is required. Specialty in discrete mathematics or algebra is preferred, along with an interest to remain active in research. Wheaton College is a Christian Liberal arts college about 20 miles west of Chicago, and agreement with a Statement of Faith is required of all faculty. The department has 7 faculty in mathematics and computer science and 100 majors. Send vita and three letters of reference to Dr. Robert Brabenec, Department of Mathematics, Wheaton College, Wheaton, IL 60187.

**DARTMOUTH COLLEGE
John Wesley Young Research Instructorship**

The John Wesley Young Research Instructorship is a two-

year post-doctoral appointment for promising new or recent Ph.D.'s whose research interests overlap with those of a department member. Current departmental interests include certain areas in algebra, algebraic number theory, analysis, algebraic geometry, combinatorics, computer science, differential geometry, logic and set theory, probability and topology. Teaching duties of four ten-week courses spread over two or three quarters typically include at least one course in the instructor's specialty and include elementary, advanced and (at instructor's option) graduate courses. Nine-month salary of \$26,000 supplemented by research stipend of \$3000 for instructors in residence for two months in summer. Send letter of application, resume, graduate transcript, thesis abstract (and description of other research activities and interests if appropriate), and 3 or preferably 4 letters of recommendation to Recruiting Committee Chair, Department of Math and CS, Bradley Hall, Hanover, NH, 03755. Applications received by Jan. 31 receive first consideration. Dartmouth College is committed to affirmative action and strongly encourages applications from minorities and women.

**DARTMOUTH COLLEGE
Assistant Professor of Mathematics**

The Department of Mathematics and Computer Science expects to have a three-year tenure-track assistant professorship available for fall of 1987. New Ph.D.'s must show exceptional promise in teaching and research. More advanced candidates should also have a strong research program and a reputation for excellent work. Tenure would normally be considered in the sixth year of the appointment, but it may be possible to arrange somewhat earlier tenure consideration for candidates with an exceptional postdoctoral record. Research in algebra (including algebraic geometry and algebraic number theory) is of most interest, followed by combinatorics, probability and topology; applicants are welcome in all fields. Assistant professors teach four ten-week courses spread over two or three quarters and may supervise graduate students. Send letter of application, statement of research accomplishments and plans, graduate transcript, resume, and four letters of recommendation to: Recruiting Committee Chair, Department of Math and CS, Bradley Hall, Hanover, NH, 03755. Applications received by Jan. 31 receive first consideration. Dartmouth College is committed to affirmative action and strongly encourages women and minorities to apply.

EASTERN ILLINOIS UNIVERSITY

Tenure-track positions for Fall 1987. Doctorate required with a commitment to teaching and scholarly activities. 9-12 hour teaching load with release time for research possible. Statistics, Mathematics Education, or Computation preferred. Closing date, January 15, 1987 or until filled. Contact A. J. Schaeffer, Eastern Illinois University, Charleston, IL 61920.

**WASHINGTON AND LEE UNIVERSITY
LEXINGTON, VIRGINIA 24450**

Two tenure-track positions at assistant professor level, at least one in analysis and/or numerical analysis (which will carry the title of Dana Fellow). Ph.D. required. W&L is a private, undergraduate college committed to quality instruction in small classes. Send resume, three letters of reference (one should address teaching experience and potential), and list of graduate courses to Search Committee, Dept. of Mathematics at the address above. Equal Opportunity Employer.

**DEPARTMENT OF MATHEMATICS AND COMPUTER
SCIENCE
BLOOMSBURG UNIVERSITY
BLOOMSBURG, PENNSYLVANIA 17815**

Two tenure-track positions beginning Fall 1987. Appointment at Assistant or Associate Professor level. Individuals with expertise in computer science or statistics are encouraged to apply. Ph.D. preferred. Salary is competitive, excellent benefits. Normal teaching load is 12 hours per week. Review of applications will begin January 1, 1987 and continue until the positions are filled or May 1, 1987. Participation in Employment Register at annual meeting is planned. Minorities, women and other protected class members are urged to apply. Bloomsburg University is an equal opportunity/affirmative action employer. Send letter, vita, transcripts and three letters of reference to John Riley, Chair, Search Committee.

**Claremont McKenna College
Department of Mathematics**

An Assistant/Associate tenure track position is available in the Mathematics Department of Claremont McKenna College, a liberal arts college with 800 students. The College is a member of the Claremont Colleges (Claremont Graduate School, Pomona-, McKenna-, Scripps-, Harvey Mudd-, Pitzer College). The Claremont Colleges have a total of forty-three mathematicians and computer scientists and are located in Claremont, Southern California.

Qualifications for the position include a Ph.D. in mathematics and some formal education in computer science. Responsibilities include teaching, research, and curriculum development. The appointee will be expected to teach courses in mathematics, some of which may involve applications to economics, and possibly, beginning computer science courses.

Compensation is competitive. The College is an equal opportunity/affirmative action employer and invites applications of qualified persons. Please send vita and have three letters of recommendation sent to Professor John A. Ferling, Claremont McKenna College, Claremont, CA 91711.

**MATHEMATICS DEPARTMENT
ENID, OK 73702**

Teach undergraduate courses in a general mathematical sciences program. Must be dedicated to excellence in undergraduate education in a quality church related university. Ph.D. in mathematics or computer science required. Salary dependent upon qualifications and experience. Send resume, transcripts and three letters of reference to Dr. Roy Rakestraw, Science and Mathematics, Box 2000 University Station, Phillips University, Enid, OK 73702. Applications will be accepted until a suitable candidate is found.

**SAN JOSE STATE UNIV.,
DEPT. OF MATH/COMP SCI
SAN JOSE, CA 95192-0103**

Four openings for Assit. of Assoc. Prof. (Professor in exceptional case), Ph.D. in any mathematical science; but prefer numerical analysis, mathematics education, stat., applied math, or computer science. Candidate 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 \$25,000-\$49,000 per academic year. Significant professional activity required for eventual tenurer consideration. Application no later than February 3, 1987. EEO/AA

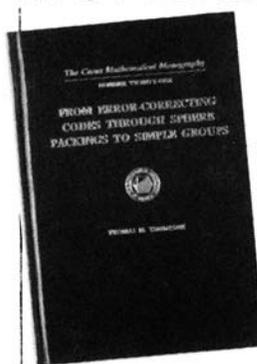
**SAN JOSE STATE UNIV.,
DEPT. OF MATH/COMP SCI
SAN JOSE, CA 95192-0103**

Three tenure-track openings, rank open, Ph.D. in computer science is preferred. Ph.D. in any of the mathematical sciences, together with substantial teaching/research experience in computer science, may also be acceptable. Commitment to quality teaching at all levels, interest in department affairs. Approx. salary \$36,000-\$55,000 p.a.y. Significant professional activity required for eventual tenure consideration. Application no later than February 3, 1987. EEO/AA

**THE COLORADO COLLEGE, MATHEMATICS
DEPARTMENT
COLORADO SPRINGS, CO 80903**

Tenure-track position available beginning Sept. 1987 in a department where research and teaching are both valued. Required: Ph.D. as well as strong ability and interest in undergraduate teaching. Desirable: Ability to teach computer science at levels above the introductory level. Salary and rank commensurate with experience. The Colorado College is an equal opportunity employer; the college encourages applications from women and minorities. Send vita and 3 letters of recommendation (at least two concerning teaching ability) to Steven Janke, Mathematics Department. Applications accepted until position is filled; however, the department will begin reviewing applications on Jan. 5, 1987.

CARUS MATHEMATICAL MONOGRAPH



**From Error-Correcting Codes through
Sphere Packings to Simple Groups,**
Carus Mathematical Monograph #21, by
Thomas M. Thompson
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List: \$21.00 MAA Member: \$16.00

Two of the most fascinating problems to challenge mathematicians in recent years concern the construction of data transmission codes that can correct errors introduced by static and the search for efficient

ways to pack ping-pong balls into a box. Can one design the best error-correcting code? Can one find the most efficient sphere packing?

Four decades of intense research have solved neither of these questions. The interesting fact is that these two problems properly interpreted are the same. Therein lies a fascinating story which is told with great skill and clarity in this important addition to the Carus Mathematical Monograph series.



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Calculators (continued from page 1)

is a four-line screen and below it an array of 37 buttons that looks vaguely like a standard calculator keyboard. On the left is a 35-button alphabetic keyboard—there is only a single “shift key” so each key has only two functions. But where are the sin, cos, and exp buttons? And why does the top row of six buttons on the right keyboard have no labels at all? Because the HP-28C is menu-driven, and the top row contains all-purpose function keys! If you want sin, press the TRIG button, which activates a trigonometry menu at the bottom of the screen, and then press the function button directly below SIN (press NEXT to see six more functions on the TRIG menu). There are other menus for logs and exponentials, equation-solving, user-defined functions, statistics, plotting, matrix operations and editing, binary arithmetic, complex arithmetic, string operations, stack operations, symbolic manipulation, program control (DO UNTIL, etc.), special real arithmetic (modulo, random number generator, etc.), printing (yes, one can buy a thermal printer with infrared remote control), and, of course, a catalog of all operations.

Like other Hewlett-Packard calculators, the HP-28C is a stack machine with operators and operands entered in reverse Polish. Stack entries can be commands, real or complex numbers, lists, strings, matrices, or algebraic expressions such as $2 * 3 + 5$ or $X * \text{SIN}(X)$. Expressions can be evaluated by pressing the EVAL key, which can be used like the “=” key on algebraic calculators by those averse to reverse Polish. If $X * \text{SIN}(X)$ is at the top of the stack and you want it symbolically differentiated, put the variable of differentiation ‘X’ on the stack and press the derivative button. To compute its degree 5 Taylor polynomial centered at 0, enter 5 and press TAYLR on the algebraic menu. To compute its definite integral from 0 to 1 enter the list {‘X’, 0, 1} and a tolerance .0001 and press the integral button. To plot $X * \text{SIN}(X)$, press DRAW on the plotting menu: Window parameters are controlled by the user as on the Casio fx7000-G; x- and y-coordinates of any point on the screen can be found by moving cross-hairs to the desired point and pressing INS. To find a root of the equation $X = \text{TAN}(X)$, put it on the stack followed by an initial guess or an interval or an interval and a guess, and then press ROOT on the equation-solving menu. To invert the 2 by 2 matrix with rows [1, 2] and [3, 4], enter [[1, 2] [3, 4]] on the stack and press 1/x. To find its determinant, press DET on the array menu. To solve a system of equations, put the left-side coefficient matrix on the stack, followed by the right-side vector, and then press ÷. To multiply two matrices on the stack, press ×.

The numerical routines are high quality. There are 12 digits of accuracy displayed and 16 digits internal. For example, with display set at three digits to the right of the decimal point, $2 \wedge 39$ EVAL yields 549755813888; multiply the result by 2 and 1.100 E 12 appears; divide that by 2 and 549755813888 reappears. The routines are also fast. A short program written to multiply a matrix times itself 100 times ran in about 2 minutes for a 6 by 6 matrix! There are some problems. Memory is limited compared to a microcomputer: 8 by 8 matrix multiplication is about all the calculator can handle and a request for the degree 5 Taylor polynomial for $\exp(\exp(x - 1))$ overflows the symbolic differentiator (try computing the fifth derivative without regrouping to see why—Wilf’s micro took 4 minutes to get the degree 9 polynomial in his 1982 article). Although the matrix algebra routines are accurate and fast, the HP-28C has never met a square matrix it couldn’t invert (presumably, matrix entries such as 1 E 500 should tell the user something is wrong).

How hard are these calculators to use? Although just clearing the Casio fx7000-G memory can be a challenge without the manual, students used to a scientific calculator should feel com-

fortable after an hour or two. Hewlett-Packard designs more for engineers than for precalculus students, and the HP-28C is no exception. It takes ten hours to become proficient enough to begin to realize the potential of this calculator, and one could spend weeks exploring the nooks and crannies of the machine. Luckily, documentation isn’t too bad. Basically, if a student can learn PASCAL, he or she can learn to use the HP-28C.

Who will use the HP-28C? It is not powerful enough to help a professional mathematician do symbolic manipulation the way MACSYMA helped Neil Sloane. (See his January 1986 NOTICES article “My Friend MACSYMA.”) But plenty of calculus students would find the HP-28C handy when they are asked on their next test to differentiate $(1 + x^2)^{\sin x}$, and so would I if I had to graph that function. The calculator can’t solve a twenty-variable linear program by the simplex algorithm, but it could be programmed to do eight or nine variables, and I can already see using the HP-28C in my linear algebra class to find eigenvectors and eigenvalues for arbitrary 5 by 5 matrices using the power method. One might cringe at a student integrating $1/(1 + x^2)$ from 0 to 1 by pressing a button and getting .785 (actually, it takes about 10 button-pushes to get the expression on the stack and another 10 to enter the integration parameters and perform the integration, although it all takes less than a minute). But what about the arc length of $y = x^3$ from $x = 0$ to $x = 1$? Something lost, something gained.

Mathematicians are traditionally wary of technology. Perhaps their qualms are justified. To think of the area under the curve $y = 1/(1 + x^2)$ from 0 to 1 as .785 and not $\pi/4$ is to miss all the beauty of a mysterious relationship between circles and triangles and areas and rates of change. Mathematicians are notoriously slow to come to grips with technology. At the Sloan Conference on Calculus at Tulane last January, a syllabus was proposed that recommended the use of programmable calculators with a Simpson’s rule button, although such calculators have existed for five years. The participants at that conference had no idea that a Casio fx7000-G or an HP-28C was looming on the horizon. How long will it take to recognize pedagogically the existence of these calculators, which many students will already have? Must it be “something gained, something lost”? Can’t it just be “something gained”? Good questions to ask, but like Wilf in 1982, it is probably time to beat a hasty retreat.

Thomas Tucker is the Chairman of the Department of Mathematics at Colgate University and a member of the Committee on Placement Examinations now working on calculator-based placement examinations.

Power (continued from page 1)

10,000 black and Hispanic college freshmen indicated an interest in majoring in mathematics.

The participation of women in the mathematical sciences is somewhat better than it was a quarter century ago, but is still far from where it might be. In the last 15 years there has been virtually no change in the number of women who receive Ph.D. degrees in mathematics, even though during this same period, increasing numbers of women have attained comparable distinction in many other careers and professions. Indeed, the retention rate of women from bachelor’s to master’s to doctoral degrees is far worse in mathematics than in any other science.

Both those who are alarmed about the quality of the undergraduate experience—as Bennett and Boyer are—and those who are concerned about the pipeline for future mathematical scientists must address the same reality: for most students, and

(continued on page 6)

Power (continued from page 5)

especially for women, blacks, and Hispanics, the undergraduate experience in mathematics fails to stimulate either intellectual development or interest in the discipline. Fewer mathematics graduates mean fewer qualified teachers, especially among those already under-represented in the mathematical sciences. The common reality we must all confront is the prospect of continued decline in the opportunity to learn.

Opportunities for Action

The shifting spotlight of national concern brings not only scrutiny but also opportunity. Last March the National Science Board issued a call for renewed NSF support for undergraduate science, mathematics, and engineering. In June, NSF convened an *ad hoc* committee of mathematicians to provide advice about the special needs of collegiate mathematics. Already NSF has responded with a new program offering Research Experiences for Undergraduates (REU). It is likely that additional programs will emerge in the next few years as NSF responds to recommendations to support faculty renewal, to stimulate student talent, to encourage curricular reform, and to provide for regular national assessment of collegiate science and mathematics.

Last spring, an MAA committee chaired by Bernard Madison submitted to the National Research Council (NRC) a prospectus for a major national study of collegiate mathematics. Recently, the two NRC mathematics boards—the Board on Mathematical Sciences and the Mathematical Sciences Education Board—endorsed an expanded plan based on this prospectus. This plan calls for a major project to renew collegiate mathematics by the year 2000, focusing on issues of talent with a special thrust towards under-represented groups.

The MAA has been working in parallel with these national efforts, laying the foundation for significant initiatives in the years ahead. Our Long Range Planning Committee has submitted its report to the Board of Governors, highlighting three major goals to guide MAA program development in coming years:

- To promote excellence in teaching mathematics
- To cultivate mathematical talent
- To enhance public awareness of mathematics

As the list of recent MAA initiatives on pages 6 and 7 illustrates, many MAA members are already working on a variety of projects to achieve these objectives and thereby help fuel the renewal of collegiate mathematics.

Even while some committees plan new ways for the MAA to exercise its responsibility for leadership of the mathematical sciences at the collegiate level, hundreds of MAA members continue work on the mainstream activities that have formed the core of MAA services for many years: publications, sections, competitions, undergraduate curriculum, to name a few. It is the quality of these core activities that provide the MAA with the strength and legitimacy to exercise leadership in response to national problems emerging in collegiate mathematics education.

From Quality to Power

Quality is both precious and fragile, easily threatened by cant and pretension. Too often, educational reform creates the appearance but not the reality of change. New fads come and go; new courses are added and old ones dropped. But through it all, the number of American students choosing careers in mathematics has continued to decline. We have to reverse this

decline, but not by gimmicks that erode the intrinsic power of mathematics. What we must do is to make the power of mathematics visible, attractive, and compelling to all students at all levels.

The paradox of our times is that as mathematics becomes increasingly powerful, only the powerful seem to benefit from it. The ability to think mathematically—broadly interpreted—is absolutely crucial to advancement in virtually every career. The challenge for mathematicians everywhere, and especially for members of the MAA, is to stimulate in all students the intellectual acumen that inheres in mathematical habits of thought.

A few years ago, the Alfred P. Sloan Foundation initiated a national program to stimulate what they called "The New Liberal Arts," based on the premise that in this age all educated men and women need thorough grounding in quantitative and technological ideas. Mathematical subjects were once part of the seven classical liberal arts, the studies "appropriate for a free person." Today, as in antiquity, the mathematical sciences are again an essential part of the education required for free men.

Confidence in dealing with data, skepticism in analyzing arguments, persistence in penetrating complex problems, and literacy in communicating about technical matters—these are the enabling arts offered by the new mathematical sciences. Whatever else the MAA may do in the remaining years of this century, it must work to ensure that these new liberating, mathematical arts are made available to *all* students.

Recent MAA Committee Initiatives

Teaching Assistants. An effort of CTUM to identify and disseminate information about how universities can help their TAs to be more effective. Project Director: Bettye Ann Case.

Calculus. A planning effort to develop a new national consensus on the aims and content of calculus appropriate to the age of symbolic calculators. Chair: Ron Douglas.

Mathematics in Grades 11-13. A joint task force of the MAA and the National Council of Teachers of Mathematics (NCTM) to examine the articulation of curricular objectives between the final two years in high school and the first year of college. Chair: Joan Leitzel.

Minorities in Mathematics. A task force established to look beyond the current BAM (Blacks and Mathematics) project to recommend programs and activities that the MAA should undertake to help under-represented minorities develop their full educational potential in mathematics. Chair: Louise Raphael.

The First Two Years of College Mathematics. A subcommittee of CUPM that is examining relationships among the many courses that all compete for limited time in a student's first two college years. Chair: Richard D. Anderson.

Accreditation. An *ad hoc* investigation to determine whether the mathematics community should develop a system of accreditation or some other mechanisms that would serve similar purposes. Chair: David P. Roselle.

Science Policy. A new standing committee to help provide an informed MAA voice in the development of national policy that affects mathematics education and the mathematical sciences. Chair: Henry O. Pollak.

Student Chapters. A new project developed by an *ad hoc* committee to attract undergraduates to mathematics and to early membership in the MAA. Chair: Howard Anton.

Remedial Mathematics. A joint project with the American Mathematical Association of Two Year Colleges (AMATYC) to make recommendations for programs and standards that would help reduce the need for remedial mathematics in American higher education. Chair: Ernest Ross.

Participation of Women. A recommendation to establish a special committee to work for full participation of women in the affairs of the MAA and to develop MAA activities that will encourage women in careers in the mathematical sciences.

Computer Science. A joint project that the MAA has undertaken with IEEE and ACM to examine the impact on students, on departments, and on professional standards in those smaller institutions in which computer science is embedded in a department of mathematics. Chair: Zaven Karian.

Preparation for College Teaching. A new joint project undertaken in cooperation with the American Mathematical Society (AMS) and the Society for Industrial and Applied Mathematics (SIAM) to make recommendations for the appropriate preparation of college teachers. Chair: Guido Weiss.

This is the final column that Lynn A. Steen has prepared during his term as MAA President.



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In Memoriam

William Bicknell, Professor Emeritus, University of Wisconsin, died September 1986 at the age of 64. He was an MAA member for 37 years.

Robert Collison, Lecturer Emeritus, University of Nevada, died October 1986 at the age of 71. He was an MAA member for 23 years.

Walter Kaufmann-Bühler, Editorial Director, Springer-Verlag, New York, died December 22 at the age of 42. He was serving as a governor of the MAA and had been an MAA member for 11 years.

Kevin Kane, ADAC Labs, died September 1986 at the age of 28. He was an MAA member for 5 years.

Ernest Kennedy, University of Texas retired, died May 1986 at the age of 87. He was an MAA member for 60 years.

Irving Reiner, University of Illinois, died October 1986. He was an MAA member for 37 years.

Lily Seshu, Portland State University, died September 1986 at the age of 61. She was an MAA member for 6 years.

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

Jeffrey Johnson; **Harwood Rosser**; **David Tolmari**, Weber State College; **Eugene Usdin**.

EDITORIAL APOLOGY We regret any inconvenience caused by late arrival of the October issue of *FOCUS* with its registration materials for the January annual meeting. Editorial and production problems connected with this unusually large and complex issue led to these delays. These problems are being overcome. Special care is being taken to assure early mailing of all meeting issues in the future. Paradoxically, this will mean that the March-April *FOCUS*, with the Summer Meeting materials, cannot be printed until after March 27, when the AMS will have completed this material. However, we plan to have this material in the mails to our members ahead of the date when the AMS sends it out in its NOTICES.

Calendar continued from page 8: July 1987

12-16. **Inter-American Conference on Mathematics Education (VI IAMCE)**, Santo Domingo, Dominican Republic. For registration information, write: Septima Conferencia Interamericana de Educacion Matemática, Centro de Investigaciones, Universidad Católica Madre y Maestra, Apdo. Postal 822, Santiago de los Caballeros, República Dominicana. Telephone (809) 583-0964; telex ITT 3461032.

20-24. **SIAM Conference on Applied Geometry**, cosponsored by the Rensselaer Polytechnic Institute, Albany, New York. Abstracts for contributed papers due February 20, 1987. For information, write: SIAM Conference Coordinator, 117 South 17th Street, 14th Floor, Philadelphia, PA 19103-5052. Telephone (215) 564-2929.

31-Aug. 3. **Boston Workshop for Mathematics Faculty**, M.I.T., Cambridge, Massachusetts. Contact Gilbert Strang, Room 2-240, M.I.T., Cambridge, MA 02139.

August 1987

4-7. **Sixth International Conference on Mathematical Modeling** to be held at Washington University. For information, write: Professor Ervin Y. Rodin, Department of Systems Science and Mathematics, Washington University, Saint Louis, MO 63130. Telephone (314) 889-5806.

Calendar

National MAA Meetings

- 64th Summer Meeting**, Salt Lake City, Utah, August 5-8, 1987.
71st Annual Meeting, Atlanta, Georgia, January 6-9, 1988.
72nd Annual Meeting, Phoenix, Arizona, January 11-14, 1989.
73rd Annual Meeting, Louisville, Kentucky, January 24-27, 1990.

Sectional MAA Meetings

- Allegheny Mountain**, Gannon University, Erie, Pennsylvania, April 1987.
Florida, Florida Atlantic University, Boca Raton, Florida, March 6-7, 1987.
Illinois, Northern Illinois University, DeKalb, Illinois, April 24-25, 1987.
Indiana, Wabash College, Crawfordsville, Indiana, March 28, 1987.
Iowa, University of Northern Iowa, Cedar Falls, Iowa, April 24-25, 1987.
Kansas, Washburn University, Topeka, Kansas, March 27-28, 1987.
Kentucky, University of Louisville, Louisville, Kentucky, April 3-4, 1987.
Louisiana—Mississippi, Mississippi University for Women, Columbus, Mississippi, February 27-28, 1987.
Metropolitan New York, Borough of Manhattan Community College, New York, New York, May 2, 1987.
Michigan, Michigan State University, East Lansing, Michigan, May 1-2, 1987.
Missouri, Northeast Missouri State University, Kirksville, Missouri, April 3-4, 1987.
Nebraska, Nebraska Wesleyan University, Lincoln, Nebraska, April 10-11, 1987.
North Central, University of Minnesota, Minneapolis, Minnesota, April 24-25, 1987.
Northern California, San Jose State University, San Jose, California, February 28, 1987; Special Meeting, University of Hawaii, Honolulu, Hawaii, March 28, 1987.
Ohio, Ohio University, Athens, Ohio, April 10-11, 1987.
Oklahoma—Arkansas, East Central Oklahoma State University, Ada, Oklahoma, March 27-28, 1987.
Pacific Northwest, Pacific Lutheran University, Tacoma, Washington, June 19-20, 1987.
Rocky Mountain, University of Southern Colorado, Pueblo, Colorado, April 24-25, 1987.
Seaway, Hobart and William Smith College, Geneva, New York, April 24-25, 1987.
Southeastern, Armstrong State College, Savannah, Georgia, April 3-4, 1987.
Southern California, Occidental College, Los Angeles, California, March 7, 1987.
Southwestern, University of New Mexico, Albuquerque, New Mexico, Spring, 1987.
Texas, Tarleton State University, Stephenville, Texas, April 2-4, 1987.
Wisconsin, University of Wisconsin Center, Sheboygan, Wisconsin, April, 1987.

Other Meetings

March 1987

27-28. **Annual IIME Undergraduate Student Conference**, St. John's University, Collegeville, Minnesota. Speaker: Reuben Hersh. For information, contact Jerry Lenz, St. John's University, Collegeville, MN 56321.

April 1987

8-11. **National Council of Teachers of Mathematics 65th Annual Meeting**, Anaheim, California. For information contact: NCTM, 1906 Association Drive, Reston, VA 22091.

24-26. **New York State Mathematics Association of Two-Year Colleges 1987 Annual Conference**, Syracuse, New York. This conference will celebrate the twentieth anniversary of NYSMATYC and be held at the Sheraton University Inn and Conference Center. For information, contact Joseph Browne, Mathematics Department, Onondaga Community College, Syracuse, NY 13215.

May 1987

21-23. **Geometry and Topology Conference**, Lehigh University, Bethlehem, Pennsylvania. Speakers: S. Bloch, M. Hopkins, B. Lawson, F. Quinn, R. Schoen, W. Thurston. For information contact D. Davis, C. C. Hsiung, or D. Johnson at Department of Mathematics, Lehigh University, Bethlehem, PA 18015. Telephone (215) 758-3730.

June 1987

15-19. **1987 Mathematical Science Lecture Series**, Johns Hopkins University, Baltimore, Maryland. Ten lectures by Richard Karp on probabilistic analysis of algorithms. For information, contact Edward Scheinerman (301) 338-7210 or Robert Serfling (301) 338-7200, Department of Mathematical Sciences, Johns Hopkins University, Baltimore, MD 21218.

15-19. **MAA North Central Section Summer Seminar on Graph Theory and Linear Algebra**, University of Minnesota, Duluth, Minnesota. This will consist of eight lectures by Allen Schwenk on the relationship between graph theory and linear algebra; talks by invited speakers and contributed papers (talks) by participants. No prior knowledge of graph theory required but undergraduate level linear algebra assumed. For information write: J. Gallian, Dept. of Mathematics and Statistics, University of Minnesota, Duluth, Minnesota 55812. Deadline for housing: May 15, 1987.

24-26. **1987 National Educational Computing Conference**, Temple University, Philadelphia, Pennsylvania. Conference information and registration forms: Frank L. Friedman, General Chair, NECC'87, Computer Activities Bldg, Box JA1, Dept. of Computer and Information Sciences, Temple University, Philadelphia, PA 19122 (215) 787-8450; specifications for submission of original papers: Laurie Scheir.

29-July 3. **ICIAM87**, First International Conference on Industrial and Applied Mathematics, LaVillette, Paris, France. Sponsored by: GAMM, IMA, SIAM, and SMAI. For information write: SIAM, 14th Floor, 117 South 17th Street, Philadelphia, PA 19103-5052, USA.

(calendar continued on page 7)

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