FOCUS

THE NEWSLETTER OF THE MATHEMATICAL ASSOCIATION OF AMERICA

From the MAA President . . . Retrospect and Prospect

Ivan Niven
University of Oregon

Now that my term as President of the Association is coming to an end, I'd like to make a few remarks about the recent past and our aspirations for the future.

The MAA is fortunate in having a clear and important goal to work for, namely to assist in promoting the interests of mathematics in North America, especially in the collegiate field. Some of the founders of the organization seventy years ago feared that it might be in danger of "degenerating into a pedagogical debating society, whose discussions might all evaporate into futility." The Association *has* been strongly interested in the promotion of good teaching, but the danger mentioned has been avoided by focusing primarily on the content of the mathematical curriculum, not pedagogical methodology.

One way to view the Association is as a vast information exchange. It is clear that none of us can survive as successful college or university teachers, or in any career in the mathematical sciences, over a thirty or forty year span without broadening our horizons far beyond our studies in graduate school, however excellent they may have been. Here then is a basic role of the Association, to enable all of us to keep up with the changing times in the world of mathematics and its teaching.

Turning to the current scene, the past three or four years have brought a vast outpouring of reports of boards and commissions on the state of education at the precollege level. The general theme of these recent reports, clearly indicated by such titles as "A Nation at Risk," is that the country is lagging in its educational effort. Terrel Bell, the U.S. Secretary of Education in President Reagan's first term, sounded the alarm about "the educational foundations of our society . . . being eroded by a rising tide of mediocrity." A center of attention in all these reports, if not *the* center, is the adequacy of programs in science and mathematics.

The Association, with its various programs and its hard-working committees, is ready for the challenge. We are moving forward on various fronts, for example:

● **Mathematical competitions.** We have continued to encourage and reward excellence in mathematics through our nationwide high school contest program, which culmi-

nates in the USA Mathematical Olympiad and the International Mathematical Olympiad. This series of competitions is currently being expanded to include a competition for junior high school students.

● **Career information for students.** The MAA has distributed to secondary school students literally hundreds of thousands of pamphlets on careers in mathematics and on
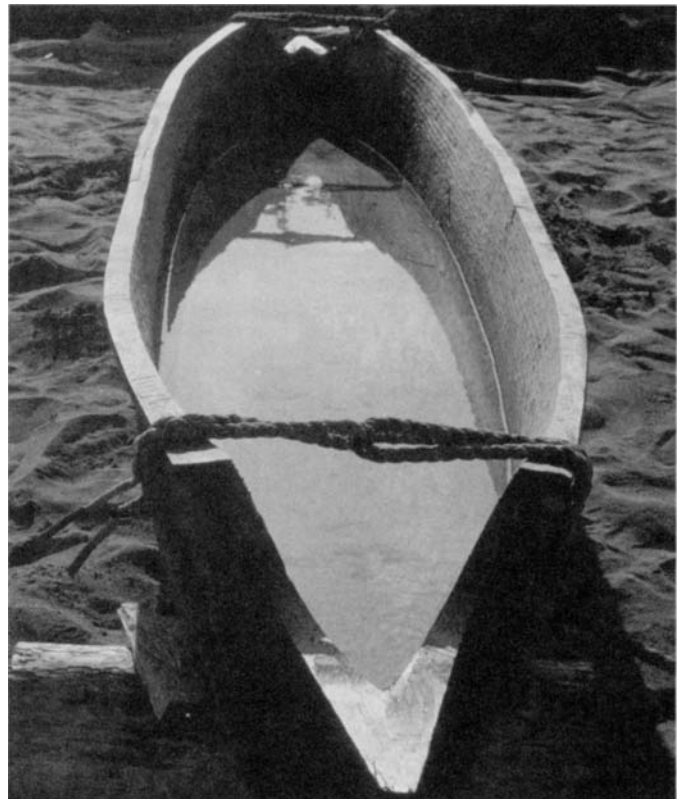
Construction of this 200-pound, ocean-going canoe by the centuries-old tradition of the Makah Indians is used to illustrate problem-solving techniques in *Challenge of the Unknown*, a new seven-part film series on mathematics for young people. See the article on page 4 of this issue.

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preparation for college mathematics. In the past few years, MAWIS (Mathematics at Work in Society) video tapes and workbooks have also been widely distributed, and are now in the permanent collections of career information at many high schools in the country.

- **Teacher Education.** The mathematical education of teachers is a high priority for the Association. An MAA panel is hard at work preparing a proposal for a major project to develop materials for teacher training which reflect the recent CUPM (Committee on the Undergraduate Program in Mathematics) recommendations. Also, the MAA and the NCTM (National Council of Teachers of Mathematics) are working together to insure that high standards are maintained in retraining of teachers. The two organizations will soon jointly issue formal statements on retraining to key people all around the country, such as school superintendents.

- **Networks.** The Bay Area Mathematics Project in California has developed a successful network program providing linkages between high school teachers and personnel from

A New Algorithm for Linear Programming

Charles Harvey
Dickinson College

A new method for solving linear programming models that may be much faster than the simplex method has been discovered by Nerendra K. Karmarkar, a 28-year-old computer scientist at Bell Laboratories. Karmarkar described his algorithm to an audience of about 1,000 management scientists at the National Operations Research meeting last November in Dallas, Texas. Plans are now underway for the testing and computer implementation of the algorithm.

The practical importance of linear optimization models was realized in the late 1940's with the development of the simplex algorithm by George Dantzig and the successful use of these models for a wide variety of applications. Since that time, the amount of work on linear optimization, or linear programming as it is often called, has been enormous. More than a thousand books and a myriad of papers have been written on the subject. Hundreds of millions of dollars are spent worldwide on the use of linear programming models for such applications as finding the optimal allocation of petroleum inputs in a large petrochemical refinery, or selecting a timber-harvesting strategy for national forest management.

During the initial period of development of linear programming, about 1947-53, a variety of algorithms were proposed. At the same time, electronic computers were being developed, and it was immediately realized that electronic computation would be a tremendous asset for the solution of large, practical linear programming models. The National Bureau of Standards analyzed sample models on their SEAC computer as means of comparing different algorithms. The clear winner was the simplex method. The historical lesson may be that computational experimentation is necessary to judge between alternative algorithms.

Since this early development of both electronic computers and linear programming, there has been a continuing interest, both theoretical and practical, in the efficiency of algorithms and, in particular, the efficiency of the simplex algorithm. Here a seeming paradox developed.

On the one hand, it was shown that for worst-case examples the running time of the simplex algorithm increases exponentially as the model size increases. On the other hand, many practitioners judged that for the models usually encountered the running time increases only linearly with model size. This discrepancy spurred interest in the discovery of an algorithm whose worst-case running time would increase only as some power of the model size, that is, a so-called polynomial-time algorithm.

Such an algorithm, the ellipsoid method, was developed during the 1970's. In 1979 the Russian mathematician, L. G. Khachiyan, proved that the ellipsoid method can solve linear programming models in polynomial time. However, it was soon realized that because of its error propogation characteristics the ellipsoid method was inferior to the simplex algorithm for applications.

Thus, the challenge was clear: to find a polynomial-time algorithm that would be an improvement on the simplex algorithm in its average-case performance.

The new method discovered by Karmarkar may well be such an algorithm. Karmarkar's method is like most other linear programming methods, including the simplex algorithm, in that it steps from one point to another within the set of feasible solutions as it travels to an optimal solution. His method is like most other methods, excluding the simplex algorithm, in that it travels through the interior of the set of feasible solutions. The simplex method moves along the edges of this set.

The attractiveness of Karmarkar's method is that it appears to provide a good direction for the step from a current point x^0 to a new point x^1. The (high-dimensional) set of feasible solutions is stretched by a projective transformation so that the point x^0 is moved to the center of the transformed set. Then, an effective direction toward the optimal point is found in this transformed set.

Interested readers who would like a detailed description of Karmarkar's algorithm can write for a copy of the working paper "A New Polynomial-Time Algorithm for Linear Programming" by N. Karmarkar, AT&T Bell Laboratories, Murray Hill, NJ 07974.

Karmarkar's algorithm has the potential of being tremendously important in practice. The operations research community feels that his method should be compared with the simplex method under experimental conditions that remove as many extraneous factors as possible. For example, the methods should be coded in the same language, should be run on the same machine, and should be given the same care to take advantage of special properties in the sample linear programming models.

If Karmarkar's algorithm proves to be more efficient than the simplex algorithm for even a subclass of linear programming computation, then far-reaching changes will be needed in the software packages that support linear programming and in the educational materials that discuss linear programming. These changes will be worthwhile if they lead to expanded opportunities for the application of linear programming models.

During the past thirty years, a primary limitation to the use of linear programming has been the reluctance of many people in business and government to adopt an approach which, despite its many successes, still appears to them to be highly innovative. The many articles that have appeared in the public press may already be having serendipitous effect of increasing the public's interest in the under-utilized capabilities of linear programming.

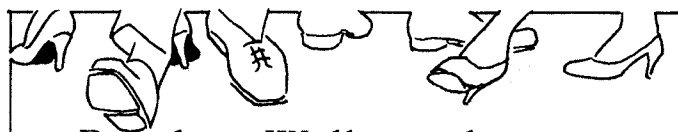## New Board Will Advise Government on Needs of U.S. Mathematics

A new Board on Mathematical Sciences has been formed by the National Research Council in Washington, D.C., to provide a unified voice for advising the government on mathematics, applied mathematics, and statistics. The Board will be chaired by Michael Artin of the Massachusetts Institute of Technology.

The Board was formed because of the concern of many mathematical scientists that support for mathematics research, which forms a basis for scientific and technological advances in many fields, will be inadequate to meet national needs. Evidence of erosion in support for mathematics research was documented in the recent National Academy of Sciences report, *Renewing U.S. Mathematics: Critical Resource for the Future.* (See *Focus*, September 1984.)

Like other Boards within the National Research Council, the principal operating agency of the National Academy of Sciences and the National Academy of Engineering, the Board on Mathematical Sciences will operate mainly through specific projects, each conducted by a committee of the best qualified experts available for the study topic. Topics will range from the research opportunities in mathematical sciences to advice on newly developed applications of mathematics and statistics that can be used to improve governmental performance. The Board is presently recruiting a full-time staff director.

Establishment of the Board was made possible through support from the National Science Foundation, Air Force Office of Scientific Research, Office of Naval Research, Army Research Office, and the Department of Energy. Board members are: Michael Artin (Chairman), MIT; Hyman Bass, Columbia University; Peter Bickel, University of California-Berkeley; Ralph Bradley, University of Georgia; Hirsh Cohen, IBM Corporation; Joseph Kohn, Princeton University; Cathleen Morawetz, Courant Institute of Mathematical Sciences, New York University; Ronald Pyke, University of Washington; Werner Rheinboldt, University of Pittsburgh; Shing-Tung Yau, University of California-San Diego.

Additional information about the Board may be obtained from: Lawrence E. McCray, Associate Executive Director, Commission on Physical Sciences, Mathematics, and Resources, National Research Council, 2101 Constitution Avenue, Washington, D.C. 20418 (202-334-3061).

from the Executive Director's desk . . .

Happy Seventieth Anniversary, MAA!

Columbus, Ohio
December 31, 1915

In accordance with the call for an organization meeting of a new national mathematical association, signed by four hundred and fifty persons representing every state in the Union, the District of Columbia, and Canada, such a meeting was held at Columbus, Ohio, on Thursday, December 30, 1915, in room 101 of Page Hall, on the campus of Ohio State University. The meeting extended through two sesions, the latter being held on Friday morning, December 31, at which time the constitution was finally adopted . . . one hundred and four persons were in attendance. A large number of whom took active part in the proceedings . . .

When the meeting was called to order, E. R. Hedrick, University of Missouri, was elected temporary Chairman, and W. D. Cairns, Oberlin College, temporary Secretary. Upon the request of the Chairman, some introductory remarks were made by H. E. Slaught, as the representative of the Board of Editors of the *American Mathematical Monthly* who had been responsible for the call for the meeting.

The meeting was then resolved into a committee of the whole for the consideration, section by section, of a constitution and by-laws, tentative drafts of which had been prepared in advance. After three hours of patient and painstaking deliberation, all mooted questions were settled except the name of the new organization. This was left to a committee to choose from the eighteen different variations which had been proposed and to report the following morning . . . The name finally chosen was adopted without a dissenting vote, as embodying more favorable points and fewer objections than any other that had been suggested. (*American Mathematical Monthly*, January 1915.)

The name of the new organization was the MATHEMATICAL ASSOCIATION OF AMERICA. Thus 1985 marks the Seventieth Anniversary of the MAA. Much has changed in our Association since its founding, but not the name and not the purpose, " . . . to assist in promoting the interests of mathematics in America, especially in the collegiate field."

Organizations, in contrast with individuals, normally celebrate their anniversaries in integral multiples of 25. No extensive formal observance will be made of this banner year. Nevertheless, it would be appropriate for each member of the MAA to pause for a moment to reflect (a) on the long, rich tradition which has shaped our modern organization, or (b) on the good-old days and the inexorable decline in the ambiance of organization life.

Happy Anniversary, MAA!

A. B. Willcox

AMS Approves Joint 1987 Summer Meeting

The American Mathematical Society (AMS) has agreed to hold a summer meeting jointly with the MAA in 1987, but has made no decision concerning summer meetings after 1988. The site of the 1987 summer meeting has not yet been determined.

The MAA and the AMS will meet jointly in the summer of 1985 at the University of Wyoming in Laramie, August 12-15.

The usual joint summer meeting will not be held in 1986 because of the International Congress of Mathematicians which will be held at the University of California-Berkeley in August of that year, although possibilities for some complementary MAA activities are being explored. Nor will a joint summer meeting be held in 1988 because of the AMS Centennial Celebration in Providence, Rhode Island; however, the MAA will cooperate with the AMS in its celebration.

The possibility of discontinuing joint summer meetings was first raised by the AMS Council a year ago. At that time, the Council passed a resolution stating that it was in favor of cancellation of all summer meetings after 1985. It was made clear, however, that this was not a final action, and there has been extensive discussion of the question since then.

The AMS resolution reflected concerns within that organization both about whether the summer meetings are still important to AMS members, and the fact that summer meetings have consistently lost money.

Discussion of joint summer meetings after 1988 will continue within the MAA and the AMS. The MAA Board of Governors feels that summer meetings are very important to the work of the Association. Every effort will be made to continue the MAA meetings alone or jointly with one or more other organizations, or to find an alternative which preserves the most important aspects of the MAA summer meetings.

Last winter, President Ivan Niven appointed an ad hoc Committee on Summer Meetings, chaired by MAA Secretary Kenneth Ross. Suggestions may be addressed to him: Professor Kenneth Ross, Department of Mathematics, University of Oregon, Eugene, OR 97403.

Challenge of the Unknown Premiers at the National Academy of Sciences

The Challenge of the Unknown, a seven-part series of films designed to "bring mathematics alive" for young people, premiered at the National Academy of Sciences on November 14. The $6.7 million series, underwritten by Phillips Petroleum Company, will be made available free of charge to elementary, junior high schools, and high schools throughout the nation beginning in March 1985.

Shot around the world, scenes in *The Challenge* range from China to Sweden, from ice climbing to diving in shark-infested waters, from the wave of the future in lighter-than-air vehicles to the ancient mysteries of Stonehenge—all in the cause of making mathematics more attractive to an increasingly disaffected student audience.

According to William C. Douce, Phillips Chairman and Chief Executive Officer, "Young people are turning away from math—making quiet, individual decisions that years down the road affect the nature and quality of our nation's scientific and technical efforts." Douce said that Phillips' decision to underwrite production of *The Challenge of the Unknown* was based in large part on the success of *The Search for Solutions*, an earlier film series sponsored by the company. This nine-part series has become the most widely-viewed educational film ever produced, viewed by some 100 million high school and junior high school students since its release in 1979.

The Challenge of the Unknown is designed for public television viewing and school use, according to Executive Producer, James C. Crimmins. The films show mathematics as

a useful problem-solving tool in a wide variety of "real-world" contexts. They give mathematics a dimension of reality by showing people using mathematics as a tool to design airships, predict avalanches, demolish old buildings, build cathedrals, improve ski jumping, and perform other tasks. Companion books will be published by W.W. Norton & Co., including an innovative Teaching Guide designed to help teachers integrate the films with their existing classroom courses.

On display at the premiere was a museum exhibition which includes a full-sized replica of a portion of Stonehenge and an authentic 16-foot cedar canoe handcrafted in the centuries-old tradition of the Makah Indians, both featured in the series. The exhibition will travel to museums of science throughout the country.

In Memoriam

Joseph Bram, U.S. Office of Scientific Research, Washington, D.C., died in May, 1984. He was an MAA member for 14 years.

William G. Buckner, Jr., Virginia Intermountain College, died August 10, 1984. He was an MAA member for 19 years.

Jeffrey E. Carter, of Carmel by the Sea, California, died August 24, 1984. He was an MAA member for one year.

Clarence H. Dalton, retired, South East Missouri State University, died September 5, 1984. He was an MAA member for 31 years.

Lawrence J. Devanney, St. Xavier High School, Cincinnati, Ohio, died June 25, 1984. He was an MAA member for 21 years.

Merle H. Eastman, of Athens, Georgia, died September 29, 1984. She was an MAA member for 24 years.

Hamilton W. Fish, Professor Emeritus of St. Mary's College, died October 11, 1984. He was an MAA member for 11 years.

E. Glenadine Gibb, University of Texas, died this year. She was an MAA member for 25 years.

Mark Kac, University of Southern California, Los Angeles, died October 26, 1984. He was an MAA member for 44 years.

Sister Mary Cordia Karl, Professor Emeritus of the College of Notre Dame of Maryland, died August 30, 1984. She was an MAA member for 52 years.

Edna E. Kramer-Lassar, Adjunct Professor Emeritus of Polytechnical Institute of New York, died July 9, 1984, at the age of 82. She was an MAA member for 42 years.

Willie Bee Rajanna, Morgan State University, died January 30, 1984. He was an MAA member for 27 years.

Lawrence W. Sheridan, retired, Pennsylvania State University, died September 28, 1984. He was an MAA member for 50 years.

James B. Speer, Executive Director of Professional Engineers of Colorado, died June 28, 1984. He was an MAA member for 14 years.

Andrew Sobczyk, Clemson University, died November 7, 1984. He was an MAA member for 44 years.

Gerold W. McCollum, of Jonesport, Maine, died August 18, 1984, at the age of 40. He was an MAA member for 3 years.

Michael J. Walsh, of San Diego, California, died October 31, 1984. He was an MAA member for 18 years.

Serving on the 27-person board of academic advisors, which provided advice on the mathematical content of the films, were MAA President-Elect Lynn A. Steen and twelve other prominent MAA members.

An announcement will appear in a forth-coming issue of *FOCUS* about how to order the films and teaching materials. For further information about the films contact: Alison Crowell, J.S. Crimmins & Co., 165 Duane Street, New York, NY 10013 (212-766-4220).

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colleges, business and industry. The MAA is actively exploring ways of "spreading the word" about this program and others like it, and encouraging the establishment of similar programs throughout the country.

At the college level, the mathematical community is involved in widespread discussion and debate on two issues: the desirability of a course in discrete mathematics as an alternative to the traditional year of calculus; the role of the computer in undergraduate courses in mathematics.

The MAA's Panel on Discrete Mathematics recently issued a preliminary report and will be holding discussion sessions at the Anaheim meeting. Their final report, which will contain at least one course outline for a mainstream discrete mathematics course, is expected about a year from now.

As to the use of computers as a tool in undergraduate mathematics, the dust has not settled yet. Reactions vary from business-as-usual at one extreme, through various stages of software use and development as tools for instruction in mathematics, to the other extreme of teachers of mathematics switching over to the teaching of computer science *per se.*

Many MAA Sections have sponsored workshops or short courses on computer science, ranging from a half-day to three weeks in length, and there have been a variety of mini-course offerings at national meetings. A joint committee of the MAA and the ACM (Association for Computing Machinery) has helped establish summer programs for retraining in computer science at Clarkson University and Kent State University, and is exploring other ways of assisting mathematics faculty members who want to learn more about computers.

As time goes on there will be more and more young scholars of mathematics who are quite at home with the use of one or more programming languages as an adjunct to their mathematical studies. I look to this group for leadership in determining the ultimate role of computers in mathematical instruction.

In these brief remarks I have covered only a few of the current activities of the MAA. My general feeling is one of pride in past achievements coupled with optimism for the future.

Let me conclude with this thought, that the Association should continue to encourage its younger members to participate in its programs, both in the sections and at the national level. They are the hope of the future. So it is with particular pleasure that I pass the gavel to the incoming president, Lynn Steen, who is one of the youngest (if not *the* youngest) presidents the MAA has had. I look forward to his vigorous and perceptive leadership.

President Niven will officially pass the gavel to President-Elect Lynn Steen at the close of the Joint Mathematics Meetings in Anaheim in January. Niven will then serve one additional year as Past-President.—Editor

People in the News

The 1984 grand prize in NEA/Kodak's "Cameras in the Curriculum" national competition went to **Quida B. Kinzey**, who retired last summer from Birmingham-Southern College. Kinzey won top honors and $1500 in the contest's postsecondary division for her 30 minute, 35 mm. slide/tape film, "The Nature of Mathematics."

One of the contest's requirements was that students get involved in helping develop the project. Kinzey's students played a large part in creating the film during a five-week course for non-math majors. Most of the students were freshmen.

Five MAA members were among the 104 mathematics and science teachers who were honored in Washington, D.C., last October for their effective and creative teaching. They are: **LeRoy C. Dalton**, Wauwatosa West High School, Wauwatosa, Wisconsin; **David Lee Drennan**, Norman High School, Norman, Oklahoma; **Alvin A. Gloor**, Westside High School, Omaha, Nebraska; **Mark E. Saul**, Bronx High School of Science, Bronx, New York; and **James Williamson**, Columbus Junior/Senior High School, Columbus, Montana.

The winners of the 1984 Presidential Awards for Excellence in Science and Mathematics Teaching were chosen from among thousands of nominees. The candidates, who had to have a minimum of five year's experience teaching in mathematics or science, were judged on their "creativity in the classroom, their effect on students, and their professional goals and activities."

Betty K. Lichtenberg, Professor of Mathematics Education at the University of South Florida, has been elected to the presidency of Mu Alpha Theta, a national honorary society for high school and junior college mathematics students. Mu Alpha Theta has approximately 20,000 members in 1000 Chapters and is co-sponsored by the MAA and the National Council of Teachers of Mathematics (NCTM).

Lichtenberg edited the *Mathematical Log* for five years and served on the Mu Alpha Theta Board of Governors. She recently completed a term on the NCTM Board of Directors and was a Regional Coordinator for the MAA's Women and Mathematics (WAM) Program.

Four mathematical scientists are among the 25 MacArthur Prize Fellows named recently by the John D. and Catherine T. MacArthur Foundation. They are: **Peter Bickel**, statistician and Dean of Physical Sciences, University of California-Berkeley; **Michael Freedman**, Professor of Mathematics, University of California-San Diego; **Fritz John**, Professor Emeritus of Mathematics, New York University; and **Alar Toomre**, astronomer and Professor of Mathematics, Massachusetts Institute of Technology.

MacArthur Prize Fellows receive five-year awards, with no strings attached, ranging from $176,000 to $300,000 apiece, depending on their age.

Barbara Joan Rose, Roberts Wesleyan College, has been appointed to a three-year term on the Department of Education's Advisory Council on Education Statistics. The eleven-member Council reviews general policies and operations of DoEd's National Center for Education Statistics.

The American Mathematical Society awarded three Leroy P. Steele Prizes at the Joint Mathematics Meetings in Eugene, Oregon, last August. The prize for expository writing was awarded to **Elias M. Stein** of Princeton University for his book *Singular Integrals and the Differentiability Properties of Functions*. The prize for a fundamental paper was awarded to **Lennart Carleson** of the Mittag-Leffler Institute of Stockholm, Sweden, for three papers published eighteen to twenty-four years ago. The 1984 Steele Career Prize was awarded to Professor Emeritus **Joseph L. Doob** of the University of Illinois, Urbana-Champaign, for his pioneering work in the theory of probability and for his profound influence on the development in that field of mathematics.

The following mathematical scientists have been elected to membership in the U.S. National Academy of Sciences: **Michael H. Freedman**, University of California-San Diego; **James G. Glimm**, Courant Institute of Mathematical Sciences, New York University; **Elliott H. Lieb**, Princeton University; and **Murray Rosenblatt**, University of California-San Diego.

Young Astronauts Program Launched

A national program which seeks to interest and elevate the skills of elementary and junior high school children in mathematics and science was launched on October 17 by President Reagan in a ceremony at the White House. According to President Reagan, the Young Astronauts Program is "an exciting new project sure to inspire our young people, lift their spirit of adventure and help prepare them for the challenges and opportunities ahead in space and on the ground."

Invitations have been sent to over 75,000 schools throughout the country to form Young Astronaut Chapters. Thousands of chapters are expected to be formed by students, teachers, schools, youth groups, and community organizations.

In addition to classroom materials featuring the ongoing manned and unmanned missions of the space program, the program includes a national newsletter, special contests and merit programs, access to a national computer bank and programs on space, and sponsored trips to launches, camps, and other space-related activities.

The program is overseen by the Young Astronaut Council, chaired by columnist Jack Anderson, and is supported by contributions from private firms, including Commodore Computers, Eaton Corporation, M&M/Mars, Martin-Marietta, Pepsi, Safeway, Rockwell, Discover Magazine, and Intersat. The Council is working closely with the National Air and Space Administration, the White House Office of Private Sector Initiatives, the Department of Education, the National Air and Space Museum, the National Space Institute, the National Science Teacher's Association, and many other educational and aerospace groups.

Further information is available from: Young Astronaut Council, 1015 15th Street, N.W., Suite 905, Washington, D.C. 20005 (202-682-1984.)

MAA Sections To Offer
Summer Short Courses

Maryland-DC-Virginia

The Maryland-DC-Virginia Section will offer two five-day Summer Workshops for college mathematics teachers:

Title: Program Design and Pascal
Dates: June 3-7, 1985
Lecturer: William J. Collins, Salisbury State College
Location: Salisbury State College, Salisbury, Maryland
Cost: $195 for instruction, room and board.

Algorithm design is a key to problem-solving and program development. A method will be presented for guiding the analysis and design of algorithms. Pascal's control structures and data types support this approach. Pascal is becoming the introductory language of choice for mathematics and computer science, is widely available on microcomputers, and has been included in Advanced Placement for high school students.

Title: Computer Solutions of Differential Equations
Dates: June 10-14, 1985
Lecturer: Herbert S. Wilf, University of Pennsylvania
Location: Salisbury State College, Salisbury, Maryland
Cost: $195 for instruction, room and board.

Students are entering college with increasingly more background in computing. This provides an opportunity for mathematics teachers to emphasize computational aspects. Differential equations offers a great deal of scope for computer applications. This workshop will study several numerical methods and will develop criteria for evaluating them. Participants should have a working knowledge of BASIC, FORTRAN, or Pascal.

For more information about either of the Maryland-DC-Virginia Section workshops, write to Dr. B. A. Fusaro, Department of Mathematical Sciences, Salisbury State College, Salisbury, MD 21801 (301-543-6470.)

Northeast

The Northeast Section, together with the University of Maine, will sponsor its Seventh Annual Short Course next June:

Title: The Total Role of the Mathematician—Researcher, Consultant, Teacher, Curriculum Developer, and Damn Nuisance
Dates: June 10-14, 1985
Lecturer: Henry O. Pollak, Assistant Vice President, Bell Communications Research
Location: University of Maine at Orono
Cost: $200 for instruction, double occupancy room, and board.

The week-long course will include morning, afternoon, and evening sessions, as well as the usual mid-week trip to Bar Harbor and the famed lobster-steak banquet Thursday night. It will conclude with lunch Friday noon.

For additional information about the Northeast Section Short Course, contact: Professor Clayton Dodge, Mathematics Department, University of Maine, Orono, ME 04469, or Professor Don Small, Department of Mathematics, Colby College, Waterville, ME 04901.

Ohio

The Ohio Section will offer two three-week short courses next summer for college mathematics faculty:

Title: Data Systems
Dates: June 10-28, 1985
Lecturer: Zaven A. Karian, Denison University
Location: Denison University, Granville, Ohio
Cost: $975 for instruction, room and board
Application deadline: March 1, 1985.

In this course, the data structures commonly used in computer science (eg., linked-lists, trees, graphs, etc.) and their applications will be studied. The course will consist of the implementation and analysis of algorithms used for the manipulation of data structures. The primary objective of the course is to enable mathematics faculty who already know how to program to teach an undergraduate course on data structures similar to CS7 of the ACM Curriculum '78 recommendations. The Pascal programming language will be used as the vehicle for algorithm implementation. Those who are not fluent in Pascal should have sufficient expertise in another general-purpose programming language (eg., BASIC or FORTRAN) to be self-sufficient.

Title: Operating Systems
Dates: June 10-28, 1985
Instructor: Ann-Marie Lancaster, Computer Science Department, Bowling Green State University
Location: Bowling Green State University, Bowling Green, Ohio
Cost: $975 for instruction, room and board
Application deadline: March 1, 1985

Operating system topics covered will include: the operating system nucleus, memory management, input/output, secondary storage management and resource allocation and scheduling. Some case studies will be considered. Course projects may include such tasks as writing device handlers and implementing new operating system commands. Participants should have assembler language programming experience and be familiar with fundamental systems programming concepts such as functions of assemblers and compilers. Course projects will be implemented using the C programming language; however, prior experience with the C language is not required.

For additional information about either of the Ohio Section Short Courses contact: Dr. Douglas Faires, Mathematics Department, Youngstown State University, Youngstown, OH 44555.

Calendar

National MAA Meetings

68th Annual Meeting, Anaheim, California, January 11-13, 1985.
65th Summer Meeting, Laramie, Wyoming, August 12-15, 1985.
69th Annual Meeting, New Orleans, Louisiana, January 9-11, 1986.

70th Annual Meeting, San Antonio, Texas, January 23-25, 1987.
71st Annual Meeting, Atlanta, Georgia, January 8-10, 1988.

Sectional MAA Meetings

Allegheny Mountain University of Pittsburgh at Johnstown, Johnstown, Pennsylvania, April 26-27, 1985.

Eastern Pennsylvania and Delaware Bloomsburg University, Bloomsburg, Pennsylvania, March 30, 1985.

Florida Stetson University, Deland, Florida, March 8-9, 1985.

Illinois University of Illinois, Champaign-Urbana, Illinois, May 3-4, 1985.

Intermountain Weber State College, Ogden, Utah, April 26-27, 1985.

Iowa Drake University, Des Moines, Iowa, April 12-13, 1985.

Kansas Kansas Wesleyan University, Salina, Kansas; joint meeting with Kansas Association of Teachers of Mathematics; March 29-30, 1985.

Kentucky Eastern Kentucky University, Richmond, Kentucky, April 19-20, 1985.

Louisiana-Mississippi Broadwater Beach Hotel, Biloxi, Mississippi; Host: University of Southern Mississippi, February 15-16, 1985.

Metropolitan New York Webb Institute of Naval Architecture, Glen Cove, New York, May 4, 1985.

Michigan Western Michigan University, Kalamazoo, Michigan, May 3-4, 1985.

Missouri Central Missouri State University, Warrensburg, Missouri, April 12-13, 1985.

Nebraska Hastings College, Hastings, Nebraska, April 1985.

New Jersey Monmouth College, West Long Branch, New Jersey, April 27, 1985.

North Central College of Saint Benedict, Collegeville, Minnesota, April 26-27, 1985.

Northeastern Norwich University, Northfield, Vermont, June 14-15, 1985.

Northern California Menlo College, Atherton, California, February or March 1985.

Ohio University of Akron, Akron, Ohio, April 12-13, 1985.

Oklahoma-Arkansas University of Tulsa, Tulsa, Oklahoma, March 29-30, 1985.

Rocky Mountain Casper College, Casper, Wyoming, March 15-16, 1985.

Seaway Rochester Hilton, Rochester, New York; joint meeting with New York State Mathematical Association of Two-Year Colleges; April 26-27, 1985.

Southeastern Wake Forest University, Winston-Salem, North Carolina, April 12-13, 1985.

Southwestern University of Arizona, Tucson, Arizona; joint meeting with American Mathematical Society and Sociedad Matematica de Mexicana; April 12-13, 1985.

Texas Texas A&M University, Galveston, Texas, April 1985.

Wisconsin Marquette University, Milwaukee, Wisconsin, April 26-27, 1985.

Other Meetings

JANUARY 1985

9-13. 91st Annual Meeting of the American Mathematical Society, Anaheim, California. Contact: AMS, P.O. Box 6248, Providence, RI 02940.

9-13. Meeting of the Association for Women in Mathematics, Anaheim, California, Contact: AWM, Box 178, Wellesley College, Wellesley, MA 02181.

12-13. Annual Meeting of the Association for Symbolic Logic, Anaheim, California. Contact: ASL, P.O. Box 70557, Pasadena, CA 91107.

16-18. NCTM Seminar Series, "Computers in the Mathematics Curriculum," Philadelphia, Pennsylvania. Contact: NCTM, 1906 Association Drive, Reston, VA 22091.

FEBRUARY 1985

11-15. Southeastern International Conference on Combinatorics, Graph Theory and Computing, Florida Atlantic University. Hour Speakers: Paul Erdös, Frank Thomson Leighton, Neil J.A. Sloane, and Robert E. Tarjan. Contact: Frederick Hoffman, Department of Mathematics, Florida Atlantic University, Boca Raton, FL 33431 (305-393-3345 or 3340).

27-March 1. NCTM Semninar Series, "Computers in the Mathematics Curriculum," New Orleans, Louisiana. Contact: NCTM, 1906 Association Drive, Reston, VA 22091.

MARCH 1985

18-22. NSF/CBMS Regional Conference on Mathematical Ecology, University of California, Davis. Lecturer: Simon Levin. Contact: Alan Hastings, Department of Mathematics, University of California, Davis, CA 95616.

21-23. NCTM Parsippany Conference, "Teaching Mathematics Better. . .Teaching Better," Parsippany, New Jersey. Contact: Beverly Whittington, Conference Chairman, R.R. #2, Box 482, Trenton, NJ 08620.

27-29. NCTM Seminar Series, "Computers in the Mathematics Curriculum," San Francisco, California. Contact: NCTM, 1906 Association Drive, Reston, VA 22091.

29-30. St. John's/St. Ben's Annual Pi Mu Epsilon Student Conference, St. John's University. Principal Speaker: I.N. Herstein. Contact: Michael Gass or Jerry Lenz, Department of Mathematics, St. John's University, Collegeville, MN 56321 (612-363-3192).