

FOCUS

THE NEWSLETTER OF THE MATHEMATICAL ASSOCIATION OF AMERICA

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Inside the IMO

A. B. Willcox

Last July the United States played host to the Twenty-Second International Mathematical Olympiad (IMO), thus becoming the first nation in the Western Hemisphere to hold this prestigious high school competition. Teams ranging in size from a single student to a maximum of eight came from twenty-seven nations. From the time the 185 students arrived in New York with their leaders to the final announcements of awards in Washington, D.C., the IMO was extensively covered in the national press. By now *FOCUS* readers probably know that the USA team carried off top honors and that all of the USA team members received prizes, four of them for perfect scores. So this report is not to inform you of the results, but to give you the view from the inside, a few reflections from one of the organizers of IMO-81.

Fortified by a grant from the National Science Foundation and commitments from half a dozen corporations and government agencies, the IMO-81 Arrangements Committee began its planning in the Fall of 1979. The work of the Arrangements Committee was guided by the advice of a steering committee, known as The Commission on the 1981 IMO.



Both of these groups contained representatives of the MAA and the National Council of Teachers of Mathematics, college, university, and industrial mathematicians, and high school teachers. The Arrangements Committee met four times from September 1979 to January 1981 and held monthly telephone conference meetings from then until June 1981. As Chairman of the Arrangements Committee, I had the responsibility of coordinating the work of the committee and,

since I had a centrally located staff on which to rely, I found myself involved with a substantial share of the actual arrangements.

A mountain of printed and specially constructed materials had to be assembled, and arrangements for the care, feeding, and entertainment of 300 visitors had to be made. As the big day drew closer the MAA Headquarters gradually became festooned with dozens of variations of the IMO-81 logo and flags of all the participating nations. We knew that many of the visitors spoke little or no English and were unfamiliar with our American ways, so translators and counsellors had to be found. Twenty-six delegations had to be met at New York airports and transported to Rutgers University on July 7 and 8. The teams had to be entertained at Rutgers University for four days. A whirlwind tour of New York City included a circumnavigation by boat of Manhattan Island and a visit to the United Nations. In the meantime, the leaders of the delegations had to be bused to Mary Washington College in Fredericksburg, Virginia so they could begin construction of the two-day IMO examination. Teams and leaders had to be transported to Georgetown University in Washington, D.C. for the Opening Ceremony on July 13.

The IMO examination was conducted without a significant hitch, despite the energy-sapping 95 degree heat and 90 percent humidity. Grading of the papers by the leaders and review of the scoring by teams of "coordinators" from the USA proceeded smoothly even while the teams and their leaders were being treated to Washington tours, evenings at a dinner theater and Wolf Trap Summer Music Theater, swimming, and various sports. Frisbie and Rubik's Cube
(continued on page 2)

An Invitation To Join The MAA

The center section of this issue contains information on the activities, services, and members of the MAA and an invitation to join the MAA. If you are not currently an MAA member, please take a few minutes and browse through this section. You may be surprised at the impressive array of activities sponsored by the MAA and at the many services available to members.

If you are already a member, a few minutes reading will remind you about how much the Association does for the mathematical community as well as how much it does for you. When you have finished, please pass the center section on to a non-member. Join us in helping the MAA grow during the challenging years ahead!

IMO (continued from page 1)

became foci of underground olympics. On July 18, the day a gala banquet was held for all participants, news began to leak out that the accumulated scores of the USA contestants had put them at the head of the pack.

The competition was brought to a formal close on July 19 at a dignified Awards Ceremony held at the National Academy of Sciences. One hundred and three contestants received first, second, or third prizes, twenty-six of them for perfect scores on the exam.

For those of us responsible for the arrangements, the IMO was an exhausting apprenticeship in international conference coordination, an uninterrupted series of sleepless nights, a crisis every hour on the hour, and an experience we wouldn't have missed for two weeks in Bermuda and a life-time supply of Pepto-Bismol. We had to cope with buses that kept hundreds of visitors waiting nearly endlessly in 100 degree heat, with sore throats, mumps, pin worms, (almost) broken bones, and swimming injuries, with lost Colombians in New York and lost Venezuelans in Washington. But cope we did, and somehow it all came together. Everyone seemed to agree that IMO-81 was one of the best ever. What made it so were three hundred individuals from twenty-seven nations with a single purpose: to share a mathematical and educational experience in international understanding. Friendships were made that will last for lifetimes. Some of the world's greatest mathematical talent was given a big boost toward maturity. It was well worth two years of planning and any amount of sweat.

Special thanks are due members of the Arrangements Committee, members of the MAA and NCTM staffs, twenty-five charming students who served as counsellors, and twenty mathematicians who donated their time as grading coordinators. All worked tirelessly and efficiently during IMO-81. Their efforts were deeply appreciated by our guests and by me.

Thanks are also due the National Science Foundation, IBM, The Army Research Office, The Office of Naval Research, Hewlett-Packard, Texas Instruments, East-Pak Sales Corporation, Rockwell International, Upjohn, McDonald's International, and the publishing companies, Houghton Mifflin, Harcourt Brace Jovanovich, Scott Foresman, and Charles E. Merrill, for their generous support.



USA team members pose in front of the statue of Einstein in the National Academy of Sciences garden following the Awards Ceremony. Team members (from left to right) are: Benjamin N. Fisher, David S. Yuen, Gregg N. Patruno, Noam D. Elkies, Jeremy D. Primer, Richard A. Stong, James R. Roche, and Brian R. Hunt.



The examination questions had to be translated into seventeen languages. Here Jury members are hard at work typing the tests.

IMO-81 Examination Questions

1. P is a point inside a given triangle ABC . D, E, F are the feet of the perpendiculars from P to the lines BC, CA, AB , respectively. Find all P for which

$$\frac{BC}{PD} + \frac{CA}{PE} + \frac{AB}{PF} \text{ is least.}$$

2. Let $1 \leq r \leq n$ and consider all subsets of r elements of the set $\{1, 2, \dots, n\}$. Also consider the least number in each of these subsets. $F(n, r)$ denotes the arithmetic mean of these least numbers; prove that

$$F(n, r) = \frac{n+1}{r+1}.$$

3. Determine the maximum value of $m^2 + n^2$, where m and n are integers satisfying $m, n \in \{1, 2, \dots, 1981\}$ and $(n^2 - mn - m^2)^2 = 1$.
4. (a) For which values of $n > 2$ is there a set of n consecutive positive integers such that the largest number in the set is a divisor of the least common multiple of the remaining $n-1$ numbers?
(b) For which values of $n > 2$ is there exactly one set having the stated property?
5. Three congruent circles have a common point O and lie inside a given triangle. Each circle touches a pair of sides of the triangle. Prove that the incenter and the circumcenter of the triangle, and the point O are collinear.
6. The function $f(x, y)$ satisfies

- (1) $f(0, y) = y + 1$,
- (2) $f(x + 1, 0) = f(x, 1)$,
- (3) $f(x + 1, y + 1) = f(x, f(x + 1, y))$,

for all non-negative integers x, y . Determine $f(4, 1981)$.

The MAA Publications Program

Edwin F. Beckenbach

One of the most important enterprises of the Mathematical Association of America is its Publications Program. This program, like most programs of the Association, is guided by a hardworking and dedicated committee which I have had the pleasure of chairing since 1971. The Publications Committee, working together with the various editors and authors, is continually challenged to keep up with the ever-changing needs of the mathematical community for expository works at various levels of collegiate mathematics. That this challenge has been met is attested to by the extraordinary quality and scope of MAA publications. I often marvel at the ability of our authors to produce such a constant flow of truly interesting, valuable, and timely new materials, and at the imagination and creativity of our editors in raising all our journals to their present standards of excellence.

The Association has three types of publications: journals, books and pamphlets, and a newsletter.

MAA Journals

The American Mathematical Monthly was founded in 1894 by Benjamin F. Finkel, a mathematics teacher who saw the need for a journal dedicated to the improvement of collegiate mathematics, and who doggedly pursued this dream despite financial difficulties and hassles with printers. From 1915, when it was taken over by the newly formed MAA, until the present day, Finkel's vision has continued to be the guiding light of the *Monthly*. The *Monthly* has won universal acclaim and a wide and loyal company of readers.

Mathematics Magazine, founded in 1926 by S. T. Saunders of Louisiana State University, did not become an MAA publication until 1960. Initially this journal, then named the *Mathematics News Letter*, was merely a series of pamphlets used to encourage membership in the Louisiana-Mississippi Section of the Association. Today *Mathematics Magazine* is a first-rate mathematics journal providing enrichment for undergraduate study and general reading in the mathematical sciences.

The Two-Year College Mathematics Journal was founded in 1970 by Prindle, Weber, and Schmidt, Inc., in cooperation with the Association. In recognition of the importance of its burgeoning two-year college component, in 1974 the Association acquired this journal as one of its official publications. *TYCMJ* has proved to be popular with members from all sectors of the MAA.

In 1980 the Undergraduate Mathematics Applications Project (UMAP) of the Education Development Center, in cooperation with the Association and the Society for Industrial and Applied Mathematics and with financial support from the National Science Foundation, initiated publication of the *UMAP Journal* through Birkhauser Boston, Inc. This quarterly journal incorporates modules designed for classroom use and articles on the application of mathematics in physical and life sciences and other areas. It is essential in this Computer Age that the Association participate fully in publications in this area.

(continued on page 7)

Two NSF Research Institutes Established

The National Science Foundation has awarded grants to the Mathematical Sciences Research Institute, Inc., in Berkeley, California, and to the University of Minnesota in Minneapolis to establish two national institutes for research in the mathematical sciences.

The institutes are designed to attract and stimulate first-class researchers in mathematical sciences. The math institutes will provide opportunities for senior mathematics researchers, younger faculty members, and postdoctoral students to spend substantial lengths of time concentrating on mathematics research projects.

The Berkeley institute, to be located on or near the University of California-Berkeley campus, will support up to 50 senior and junior scholars working in areas of pure and applied mathematics that are considered ripe for major advances. Each year the staff of the institute, in consultation with its Scientific Advisory Committee, will select two areas of the mathematical sciences for concentrated study. The first year the focus will be on non-linear differential equations and on numerical methods and statistics. Dr. S. S. Chern will be director of the Berkeley institute, and Dr. Calvin C. Moore will be associate director. The award for the first year of the project will be at the level of \$1.6 million.

The Minnesota institute will concentrate on ways to bridge the gap between growth in certain areas of pure mathematics and areas of other disciplines in which mathematical discoveries might be applied. Each year, a particular mathematical problem area in the biological, physical, engineering, or social sciences will be presented to the members of the institute. The first year will focus on statistical and continuum approaches to phase transitions, or phenomena in which materials undergo abrupt changes in their physical properties. Dr. Hans Weinberger will be director of the Minnesota institute, and Dr. George Sell will be associate director. The award for the first year will be at the level of \$800,000.



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Co-chairmen of the MAA Newsletter Editorial Committee: J. Arthur Seebach and Lynn Arthur Steen, St. Olaf College.

Readers are invited to submit articles, announcements, or Letters to the Editor for possible publication in *FOCUS*. All materials should be sent to the Editor at the MAA Headquarters in Washington, D.C.

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friends of FOCUS

Did you enjoy reading Al Willcox's article "Inside the IMO"? How about the story on the van der Waerden and Littlewood Conjectures in the June issue? Or Dick Anderson's "Challenges of the Eighties" in the March issue?

We hope routinely to publish articles like these, along with a variety of reports and announcements, to help MAA members keep better informed about the activities and services of the Association as well as current events in the mathematical world.

If you have read the first issues of *FOCUS* with pleasure and if you believe, as we do, that *FOCUS* is a valuable tool for strengthening ties within the mathematical community, we invite you to become one of the *FRIENDS OF FOCUS*. To do so, simply fill out the pledge card on the flap of the envelope inserted in this issue, write a check to "MAA" for whatever amount you wish (or pledge payment later), and mail your contribution to the MAA Headquarters in Washington, D.C. Remember that contributions to the MAA are tax-deductible.

We are making this appeal because *FOCUS* is no exception

to the rule that it costs a lot of money to launch a new publication. Until *FOCUS* becomes well established and is able to produce some income on its own, it needs a helping hand from the members of the Association who believe in it.

If you make a donation before November 15, 1981 your name (and the name of your spouse or honoree, if desired) will be listed in the January issue of *FOCUS*. As a further token of appreciation, for a gift of \$20 or more, you may designate someone to receive a gift subscription to *FOCUS*. (All *members* receive *FOCUS* as a privilege of membership, so this should be an interested *nonmember*.)

Last May we sent letters to all twenty-year members of the Association inviting them to contribute to the *FRIENDS OF FOCUS* Fund. The preliminary results of this appeal are deeply gratifying. One hundred and fifty-seven members have already made contributions ranging from \$2 to \$500 for a total of more than \$4000 and an average gift of more than \$25. We have written to each donor individually, but would like to take this opportunity once again to express our gratitude. The names of all twenty-year donors to date are listed on this page.

We hope that you will decide to follow in the footsteps of these young-in-spirit twenty-year members and become a *FRIEND OF FOCUS* today!

Edwin F. Beckenbach, Chair

Henry L. Alder

David P. Roselle

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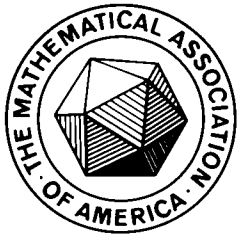
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Special Membership Supplement

An Invitation

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Would you like to be "up" on the latest developments in collegiate mathematics?

- New directions in the undergraduate mathematics curriculum
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If so, you should consider becoming a member of the Mathematical Association of America (MAA).

MAA members regularly receive

- Journals containing outstanding articles on old and new mathematical ideas at a variety of levels of exposition—*The American Mathematical Monthly*, *Mathematics Magazine*, *The Two-Year College Mathematics Journal*.
- *Focus*, *The Newsletter of the Mathematical Association of America*, containing timely articles on matters of general mathematical interest.

MAA members are entitled to reduced prices for any of the books published by the MAA—over 100 of them—ranging from high school to graduate level.

MAA members have the opportunity to participate in national and regional meetings of working professionals in the mathematical sciences, sharing their common interests and concerns.

MAA members have the satisfaction of knowing that they are helping encourage young people to excel in mathematics through MAA-sponsored contests (national and international), lectureship programs, mathematics clubs, films, videotapes, and pamphlets.

If you are interested in mathematics, you are eligible for election to membership in the Association. The membership fee, which depends on the journals that you select and on whether you are a student, may be sent now or charged to MasterCard or Visa. All you need to do is fill out the membership application form on the back page of this section and return it to the MAA's Washington Headquarters. You may use the postage paid envelope inserted in this issue of *Focus*.

You will find more information about the activities and members of the MAA on the following pages of this Special Membership Supplement and in the regular news sections of *Focus*. I hope that you will read on and decide to join us as we work and learn together, building a stronger and better mathematical community.

Sincerely,

Richard D. Anderson, President
Mathematical Association of America

MAA ACTIVITIES AND SERVICES

The Mathematical Association of America has been serving the mathematical community since 1915. Its purpose, as stated in the Bylaws, is to assist in promoting the interests of the mathematical sciences in America, especially in the collegiate field,

- by holding meetings in any part of the United States or Canada for the presentation and discussion of mathematical papers
- by the publication of mathematical papers, journals, books, monographs, and reports
- by conducting investigations for the purpose of improving the teaching of mathematics
- by cooperating with other organizations whenever this may be desirable for attaining these or similar objects.

National Meetings	The MAA holds its Annual Meeting in January and its Summer Meeting in August each year in conjunction with the meetings of the American Mathematical Society and, generally, one or more other national mathematical organizations.
Sectional Meetings	There are twenty-nine Sections of the Association, each composed of the members of the MAA living in the same geographical area. Each Section holds one or two meetings annually. These meetings are also often held in conjunction with the meetings of other mathematical organizations.
Journals	<p><i>The American Mathematical Monthly</i> is published ten times a year. It contains original and expository articles, many of which may be read with profit by those having mathematical knowledge only at the level of the calculus. The <i>Monthly</i> also contains classroom notes, solved and unsolved problems, articles on mathematical education, and book reviews.</p> <p><i>Mathematics Magazine</i> features expository articles, problems, reviews, and other materials which are of interest to the undergraduate student and the general mathematical reader. It is published five times a year.</p> <p><i>The Two-Year College Mathematics Journal</i>, also published five times a year, is directed primarily to the needs of the two-year college community. However, many of the articles in this journal are of interest to students and faculty at all levels.</p>
Newsletter	<i>Focus</i> is a new publication of the Association designed to keep MAA members abreast of current events in the mathematical community.
Books	The MAA publishes five series of books at various levels of exposition: <i>The New Mathematical Library</i> , <i>The Dolciani Mathematical Expositions</i> , <i>The Raymond W. Brink Selected Mathematical Papers</i> , <i>The Carus Mathematical Monographs</i> , <i>MAA Studies in Mathematics</i> . MAA publications also include miscellaneous books such as annotated bibliographies, two- and four-year college library lists, and contest problem books.
Curriculum Studies	The Committee on the Undergraduate Program in Mathematics and other MAA committees study the undergraduate mathematics curriculum and make recommendations on the training of mathematics teachers, the mathematical sciences major, the role of statistics and computer science in college mathematics programs, mathematics in the two-year college, and other curricular concerns.
Pamphlets	The MAA publishes various pamphlets for students, teachers, and guidance counsellors. Over one-half million copies have been distributed in recent years.
Prizes	The MAA makes a number of awards annually to recognize distinguished service to the mathematical community and excellence in expository mathematical writing: The Award for Distinguished Service , The Chauvenet Prize , The Lester R. Ford Award , The Carl B. Allendoerfer Award , The George Pólya Award .
Contests	<p>The Putnam Competition is a mathematical contest in which teams of students from colleges and universities in the United States and Canada compete for team and individual honors.</p> <p>The Annual High School Mathematics Examination is a secondary school contest. Over 420,000 students in the United States, Canada, and foreign countries participated this past year. The USA Mathematical Olympiad is a contest for the 150 or so top-ranking students on the Annual High School Mathematics Examination. High ranking students on the USA Olympiad compete in the International Mathematical Olympiad. This Olympiad was held in the United States for the first time last summer. These contests are sponsored jointly by the MAA and several other mathematical organizations and receive additional financial support from government and industry.</p>
Films and Videotapes	With support from the National Science Foundation, the MAA has produced several dozen films on various mathematical topics and, just recently, four video cassettes entitled "Mathematics at Work in Society."
Lectures	Under the Program of Visiting Lecturers and Consultants , the MAA offers the services of visiting mathematicians to colleges and universities. The visitors spend up to two days on campus conferring with students and faculty and lecturing on topics in pure and applied mathematics, computer science, and statistics.

Women and Mathematics is a secondary school lectureship program aimed chiefly at ninth- and tenth-grade young women. It is designed to encourage them to continue their study of mathematics.

Blacks and Mathematics is a similar MAA program which helps address the problem of the imbalance of blacks in scientific and technological careers. Its purpose is to increase the awareness of young black students of the need for mathematics courses in preparing for mathematics-related careers.

Faculty Services

At each Annual Meeting, **The Mathematical Sciences Employment Register** provides for communication between mathematical scientists available for employment and employers with positions to fill. The Employment Register is jointly sponsored by the MAA, the American Mathematical Society (AMS), and the Society for Industrial and Applied Mathematics (SIAM). It is administered by the AMS.

Employment Information in the Mathematical Sciences is a periodical sponsored jointly by the MAA and the AMS which contains descriptions of positions available in college and university departments of mathematics and mathematical sciences. It is published six times a year by the AMS.

Through the **Sabbatical Exchange Information Service**, MAA members interested in arranging sabbatical exchanges are put in touch with like-minded individuals from other institutions in other parts of the United States or foreign countries.

Placement Tests

The **Placement Test Program** of the MAA provides a battery of tests, ranging from "Basic Skills" to "Calculus Readiness," to assist faculty members with placement of college students in entry-level mathematics courses.

Clubs

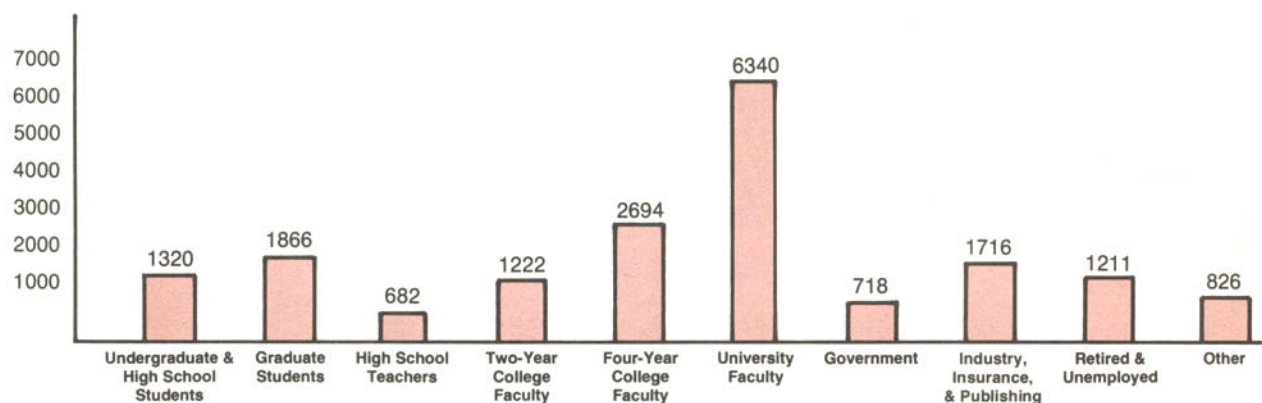
Mu Alpha Theta is a national high school and two-year college mathematics club with 1200 active chapters. It is jointly sponsored by the MAA and the National Council of Teachers of Mathematics.

Insurance

MAA members are eligible for a program of group life and excess major medical insurance.

MAA MEMBERS

The membership of the MAA is now over 18,500 individuals, including more than 900 residents of foreign countries, and 475 Academic and Corporate Members. The largest single group of individual members consists of faculty from institutions offering graduate degrees in mathematics. Teachers at four-year liberal arts colleges constitute the next largest group in the MAA. The MAA also has substantial numbers of members who are high school, college, or graduate students, high school teachers, two-year college teachers, government workers, industrial employees, or employees of insurance or publishing firms. The bar graph below gives the number of members in each of these categories as of January 1, 1981.



MAA ORGANIZATION AND STAFF

Board of Governors

The MAA is governed by a Board which is composed of representatives from each of the 29 Sections, Governors-at-Large, Editors, and past and present Officers—about fifty people in all. The Board meets twice a year at the Annual and Summer Meetings and is responsible for establishing the policies of the Association, overseeing the budget, and giving final approval to committee projects and recommendations. The Executive and Finance Committee handles MAA affairs between meetings of the Board and formulates proposals concerning the programs and finances of the MAA for consideration by the Board.

Committees

The programs of the Association are largely carried out by national committees, some fifty in number. A few of these committees and their chairpersons are:

Committee on High School Contests—Steven B. Maurer

Publications Committee—Edwin F. Beckenbach

Committee on Secondary School Lectures—Donald B. Small

Committee on the Teaching of Undergraduate Mathematics—James W. Vick

Committee on Two-Year Colleges—John D. Bradburn

Committee on the Undergraduate Program in Mathematics—Donald W. Bushaw

Committee on Visiting Lecturers and Consultants—Malcolm W. Pownall

Committee on the Exchange of Information on Mathematics—James R. C. Leitzel

The Sections of the Association also have a large number of active committees. In addition, MAA members serve on a number of joint committees with representatives from several mathematical organizations.

Staff The staff of the Association consists of about twenty people who work in the Headquarters Office in Washington, D.C., the Editorial Office in Buffalo, New York, or the Annual High School Contest Office at the University of Nebraska. They are directed by:
Executive Director—Alfred B. Willcox
Associate Director—Marcia Peterson Sward
Editorial Director—Raoul Hailpern
Executive Director of the Annual High School Mathematics Examination—Walter E. Mientka

Headquarters The three-building **Dolciani Mathematical Center** of the MAA is located in Washington, D.C., just off Dupont Circle. The main headquarters building, the **Edgar H. Vaughn Building**, is a convenient "home away from home" for visiting members and a frequent meeting place for committees.

Send this application to: Mathematical Association of America
 1529 Eighteenth Street, N.W.
 Washington, D.C. 20036

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INSTITUTION AWARDING DEGREE _____

MONTH/YEAR OF BIRTH _____ HAVE YOU BEEN AN MAA MEMBER BEFORE? Yes No

Enclosed is payment (only U.S. Funds accepted): \$ _____ for one-year membership beginning January 1, 1982.

Method of payment: Check enclosed VISA MasterCard

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Expiration Date
(month/year)

Interbank Number (MasterCard only—located above name on card)

All MAA members receive *FOCUS*, the Newsletter of the Mathematical Association of America.

You may elect to receive any of the listed combinations of the three MAA journals:

- The American Mathematical Monthly* (M)
- The Two-Year College Mathematics Journal* (T)
- Mathematics Magazine* (G)

Please circle the appropriate box corresponding to the selection of journals you wish to receive.† Enclose the indicated payment with this application.

Membership Jan. 1982 to Dec. 1982

	M	M+G	M+T	T	T+G	M+T+G
New Member (special rate)	\$34.00	\$44.00	\$44.00	\$24.00	\$34.00	\$54.00
Student/Unemployed Member‡	\$20.00	\$25.00	\$25.00	\$15.00	\$20.00	\$30.00

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† Annual member subscription prices of \$20 (M), \$10 (T), \$10 (G), \$1 (FOCUS) (for student/unemployed members, \$10 (M), \$5 (T), \$5 (G), \$1 (FOCUS)) are included in the dues.

‡ Student Membership is available to high school and undergraduate students and students regularly enrolled in graduate study at least half-time. Student dues are also available on request to unemployed mathematicians for a period of up to two years.

CUPM Panel Recommends Mathematical Sciences Major

A Panel of the Committee on the Undergraduate Program in Mathematics (CUPM) recommends that mathematics departments at most American colleges and universities replace their traditional mathematics major with a mathematical sciences major requiring courses in applied mathematics, probability and statistics, computer science, and operations research. This important new recommendation comes out of a four-year effort supported by a grant from the Sloan Foundation to develop recommendations on mathematics program objectives, structure, and pedagogy.

The report on the General Mathematical Sciences Program has recently been published by the MAA. Chapter I contains discussions of various topics on the mathematical sciences major: Current Issues Affecting the Mathematics Major, Principles for a Mathematical Sciences Curriculum, Teaching Mathematical Reasoning, Matters of Contention: How Much Theory, Sample Mathematical Sciences Majors, Minor in a Mathematical Sciences Program, Examples of Some Successful Mathematical Programs, Departmental Self-Study and Publicity, New Course Descriptions: Applied Combinatorics, Applied Algebra, and Numerical Analysis. Chapters II through VI contain Reports of Subpanels on the Calculus Sequence, Upper-Level Core Mathematics, Computer Science, Modeling and Operations Research, and Statistics.

The Panel feels strongly that the primary goal of the major, no matter what it is titled, should be to develop the student's ability to reason mathematically. Such reasoning can be

taught through a combination of problem solving and abstract theory. The Panel recommends that most topics be introduced from a problem-solving approach. Theory should be introduced later to simplify, unify, or explain questions of interest to students.

Copies of the report will be sent to all Mathematical Sciences or Mathematics Department Chairpersons. Individual copies may be purchased for \$3.50 from the Mathematical Association of America, 1529 Eighteenth Street, N.W., Washington, D.C. 20036.

Members of the CUPM Panel on the General Mathematical Sciences Program are: Richard Alo of Lamar University, Winifred A. Asprey of Vassar College, Peter J. Hilton of Case Western Reserve University, Donald L. Kreider of Dartmouth College, William F. Lucas of Cornell University, Fred S. Roberts of Rutgers University, Gail S. Young of Case Western Reserve University, and Alan C. Tucker of SUNY at Stony Brook (Chairman). The five subpanels responsible for specific subject areas involved an additional twenty-three individuals.

Awards for Journal Articles Announced

Articles with the intriguing titles of "The King Chicken Theorems" and "Sherlock Holmes in Babylon" are among the MAA journal articles published during 1980 that were singled out for special recognition at the 1981 MAA Summer Meeting.

Lester R. Ford Awards for articles in *The American Mathematical Monthly* went to:

- Lawrence Zalcman for "Offbeat Integral Geometry," March 1980, pages 161-175.
- R. Creighton Buck for "Sherlock Holmes in Babylon," May 1980, pages 335-345.
- B. H. Pourciau for "Modern Multiplier Rules," June-July 1980, pages 433-452.
- E. R. Swart for "The Philosophical Implications of the Four-Color Problem," November 1980, pages 697-707.
- Alan H. Schoenfeld for "Teaching Problem-Solving Skills," December 1980, pages 794-805.

Mathematics Magazine authors who received **Carl B. Allendoerfer Awards** are:

- Stephen H. Maurer for "The King Chicken Theorems," March 1980, pages 67-80.
- Donald E. Sanderson for "Advanced Plane Topology From an Elementary Standpoint," March 1980, pages 81-89.

Recipients of the 1980 **George Pólya Awards** for articles in *The Two-Year College Mathematics Journal* are:

- E. D. McCune, R. G. Dean, and W. D. Clark for "Calculators to Motivate Infinite Composition of Functions," June 1980, pages 189-195.
- G. D. Chakerian for "Circles and Spheres," January 1980, pages 26-41.

Checks for \$100 were presented to the authors at the MAA Business Meeting on Tuesday, August 18, in Pittsburgh.

The Lester R. Ford Awards, named after the twenty-first president of the MAA, The Carl B. Allendoerfer Awards, named after the twenty-sixth president of the MAA, and The George Pólya Awards, named after the renowned teacher and writer, were all initiated in 1977 by the MAA Board of Governors.



New from the Dolciani Mathematical Exposition Series

GREAT MOMENTS IN MATHEMATICS BEFORE 1650, by
Howard Eves
xiv + 269 pages. Hardbound.
List: \$22.00 MAA Member: \$17.00

Outstanding achievements from antiquity to about 1650 are described in a clear informal style appealing to anyone interested in mathematics. A companion volume of great moments from 1650 to the present will be published soon.

Order your copy from:
MATHEMATICAL ASSOCIATION OF AMERICA
1529 Eighteenth Street, N.W.
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Career Awareness Materials for Secondary Students Now Available

A new way of answering the classic student complaint about mathematics—"But what will I ever use it for?"—has been developed by an enterprising group of MAA members. Starting this Fall, "Mathematics at Work in Society" (MAWIS), a set of four video-cassettes and a project book, will be available to schools throughout the United States primarily for use with 8th-10th grade students. MAWIS is funded by a grant to the MAA from the National Science Foundation.

Each video-cassette runs approximately twenty minutes and features men and women in mathematics-related careers talking about what they do, how they feel about their work, and the academic preparation required for their jobs. The speakers are unrehearsed and unscripted and talk about their work with spontaneity and sincerity.

The four video-cassettes are:

- **An Actuary—What's That?**

The question in the title is answered by an actuary with Connecticut Mutual Life Insurance Company. He describes the mathematics behind the insurance business, the types of mathematics he uses, and the mathematics he studied in order to become an actuary.

- **Mathematics in Space**

Several employees at NASA's Johnson Space Center in Houston, including an astronaut, a mechanical engineer, a computer analyst, and a machinist, talk about the mathematics that is essential to their work as they prepare for future space flights.

- **Mathematics: The Language of Research**

An applied mathematician at Bell Laboratories describes her research on integrated circuits and the help she gets from others on her research team. The other members of the team—a numerical analyst, an information specialist, and a word processor—discuss the roles that mathematics plays in their work.

- **Mathematics: Where Will I Ever Use It?**

A high school mathematics teacher talks about the satisfactions of her job and what it takes to be a good teacher. Information about the mathematics used in several other professions—meteorologist, entomologist, geologist, carpenter, architect, and nurse—is also presented in this cassette.

The MAWIS project book is designed to extend the scope of the message of the video-cassettes: almost every career depends on mathematics in one way or another. It contains realistic problems using the mathematics usually covered in grades 8-10 as well as information on specific careers.

MAWIS video-cassettes will be loaned to high schools without charge through the MAA Secondary School Lectureship Programs in each of the twenty-nine sections of the MAA.

MAWIS was conceived at the 1978 MAA Winter Meeting in Atlanta in response to reports of large numbers of requests from high schools for MAA lecturers. After much thought and activity, a proposal written by John Jobe of Oklahoma State University and Susan Devlin of Bell Laboratories was submitted to NSF early in 1980. Notification that the proposal had been funded was received in August 1980 and production of the video-cassettes began the following month.

The MAWIS Steering Committee consists of Susan Devlin (Chairperson), Della Bell of Texas Southern University, David Schneider of the University of Maryland-College Park, and Donald Small of Colby College. Jim Choike of Oklahoma State University is the Coordinator of Written Materials and John Jobe is both the MAWIS Director and the Coordinator of Video Production.

Readers who would like more information about MAWIS may write to Dr. A. B. Willcox, Mathematical Association of America, 1529 Eighteenth Street, N.W. Washington, D.C. 20036.

The 1982-83 Sabbatical Exchange Program

The MAA Sabbatical Exchange Information Service is now accepting listings for the 1982-83 academic year. This service helps faculty members who are interested in no-cost sabbatical exchanges to contact individuals with similar interests at other institutions.

MAA members who want to be listed in the January 1982 SEIS Directory should write to SEIS, Mathematical Association of America, 1529 Eighteenth Street, N.W., Washington, D.C. 20036, enclosing the following information about themselves:

1. Name
2. Institution
3. Department
4. Address
5. Rank
6. Major field of interest
7. Highest earned degree
8. Names of from one to five courses recently taught
9. Normal teaching load
10. Section of the United States or foreign country preferred for visit
11. Period during which exchange is desired (e.g. all of academic year 1982-83, the first two quarters of 1982-83, the second semester of 1982-83, etc.)
12. Whether this is an "official" sabbatical.

In order to be included in the 1982-83 SEIS Directory, this information must reach the MAA Washington Office by December 1, 1981. Please type or print legibly to ensure the accuracy of the listing.

Some successful exchanges have involved trading teaching duties, living quarters, cars, etc. However, the extent of the exchange depends entirely on individual circumstances. In some cases, salaries may not need to be discussed at all. Each faculty member remains on the payroll of his/her permanent institution and receives all normal fringe benefits. In other cases, some salary negotiations may be necessary depending on the policies of the institutions, whether or not one or both individuals will be on "official" sabbaticals, whether teaching duties will be full-time or part-time, and so on.

SEIS Directories will be sent to all SEIS participants around January 1, 1982. Others who want copies should write to SEIS at the address above. There is no charge for MAA members. Non-members should enclose a check or money order for \$5.

Once the Directory is distributed, it is up to the individuals to contact likely prospects and to make all arrangements with the faculty members, departments, and institutions involved.

Ohio Commission Urges Improvements in College Prep Curriculum

The Ohio Board of Regents and The State Board of Education in Ohio have jointly acknowledged the need for better preparation in mathematics and English of many students entering college in Ohio. A blue ribbon committee—The Advisory Commission on Articulation Between Secondary Education and Ohio Colleges—has produced a report in which it reaffirms the importance for college-bound students to develop the academic skills necessary for college-level work and makes a series of recommendations on the secondary school curriculum designed to achieve this goal. Among the recommendations of the Commission are the following:

- All college preparatory students should take a minimum of three years of high school mathematics. Those interested in fields requiring calculus should take mathematics courses in all four years of high school.
- One year of college preparatory mathematics should be taken in the senior year of high school.
- High school mathematics courses should emphasize problem solving.
- Starting with algebra, students should learn to use hand-held scientific calculators and should gain experience in their use in a variety of applications.
- At the end of the junior year of high school, students should undergo diagnostic mathematics testing which will indicate their achievement level relative to college entry standards.
- Calculus, where offered in the secondary schools, should be at least a full-year course. Only those students who are strongly prepared in algebra, geometry, trigonometry, and coordinate geometry should take calculus in secondary school.
- It is highly desirable, although not yet essential, that students have first-hand experience with computers.

The Ohio report also contains recommendations on the college preparatory curriculum in English, teacher preservice and inservice education, and communication within the educational community and with students and their parents. Copies of the report, which is entitled "Report: Advisory Commission on Articulation Between Secondary Education and Ohio Colleges," may be obtained for \$3.00 by writing to Dr. Elaine Hairston, Ohio Board of Regents, 30 E. Broad Street, 3600 State Office Tower, Columbus, OH 43215.

Features Transferred from *Monthly* to *FOCUS*

The "News and Notices" section of the *American Mathematical Monthly* will be transferred to *FOCUS* according to this schedule: Announcements—September 1981; Personal Items—January 1982.

The "Calendar of Future Meetings" and "Future Meetings of Other Organizations" will be transferred in January 1982. "Official Reports and Communications" will continue to be published in the *Monthly* as a permanent record of the actions, recommendations, and reports of the Association.

It is hoped that these changes will improve communications within the Association and avoid unnecessary duplication.

Publications (continued from page 3)

MAA Books and Pamphlets

A few years after the establishment of the *Monthly* as its official journal, the Association started a new venture, the publication of expository books on mathematics. The *Carus Mathematical Monographs*, the first of the MAA serial publications, were made possible by a series of gifts from Mary Hegler Carus. Their purpose was then, and has continued to be, to make topics in pure and applied mathematics accessible to teachers and students of mathematics and to nonspecialists and scientific workers in other fields. The older volumes, starting with *Calculus of Variations* by Gilbert Ames Bliss, published in 1925, still retain much of their freshness and vigor. The newest title, *The Generalized Riemann Integral* (No. 20) by Robert McLeod, was added to the series a year ago. The third edition of Ralph Boas' timeless classic *A Primer of Real Functions* (No. 13) will appear this Fall.

The *MAA Studies in Mathematics*, begun in 1962, are technically the most advanced series published by the Association. The *Studies* present expository articles at the collegiate and graduate levels on recent developments in such areas as mathematical biology, probability theory, algebraic geometry, and functional analysis. There are twenty-one volumes in this growing series.

In 1973 a generous gift from Mary P. Dolciani enabled the Association to launch the popular *Dolciani Mathematical Expositions*. The first four books in this series (*Mathematical Gems I, II*, *Mathematical Morsels*, and *Mathematical Plums*) contain fascinating problems at an elementary level with ingenious solutions and often intriguing implications. The fifth, *Great Moments in Mathematics Before 1650*, has just recently been published.

Another major gift, this one from Carol R. Brink in memory of her husband Raymond W. Brink, provided the financial base for publication of the *Raymond W. Brink Selected Mathematical Papers*. The four volumes now in the series (Pre-calculus, Calculus, Algebra, and Geometry) offer collections of papers reprinted from the journals of the Association. Additional volumes, on number theory and analysis, are currently being developed.

Beginning in 1975, the Association offered its membership still another new series, the *New Mathematical Library*. This popular collection of books was established in 1961 by the School Mathematics Study Group and was then published for a number of years by Yale University Press and Random House. Each volume is an attractive paperbound book written by a leading mathematician for the high school and college student who wants a new challenge in understanding and appreciating important mathematical concepts. With the publication this year of *The Mathematics of Games and Gambling* by Edward Packel, the series now contains twenty-eight titles. Several other volumes are in preparation.

In addition to these five series, the Association has a number of publications that fall into the "miscellaneous" category. These include such nontechnical books as *Professional Opportunities in the Mathematical Sciences* and *A Compendium of CUPM Recommendations*, as well as various indices to the journals, bibliographies of expository literature in mathematics, and library lists for two- and four-year colleges. Several volumes, such as the *Putnam Problem* (continued on page 8)

Publications (continued from page 7)

Book, *Critical Variables in Mathematics Education*, and the *Chauvenet Papers*, which do not fit into any of the existing series, are also categorized as "miscellaneous publications." A forthcoming title in this category is *Two-Year College Mathematics Readings* edited by Warren Page. Finally, the Association publishes a number of small pamphlets containing information on careers, curricula, and other concerns in mathematics.

Altogether the foregoing serial and miscellaneous books amount to about one hundred titles. A commercial publisher, having saturated his primary markets, likely would have let many of the older titles go out of print long ago because of the high costs of warehousing and processing. But these books are extremely well written, their contents remain valid, sales are steady though slow, and the Association is here to serve, not to make money. So most of the books remain in print, though financial pressures mount as the number of titles increases. It would please me very much to see the establishment of a special Library Fund to keep meritorious older books of the Association in print.

MAA Newsletter

In the mid 1970's, leaders in the Association sensed a need for an informal periodical of mathematical news, and seriously considered publishing a mathematics news magazine, to be called *Mathematical World*. This project was abandoned in 1977 because of the concerns that it might overly strain the editorial and financial resources of the Association.

In 1978 attention turned instead to the less burdensome proposition that the Association publish a newsletter. This suggestion was enthusiastically endorsed by the Committee on Publications, the Executive Committee, and the Board of Governors. The newsletter, *FOCUS*, became a reality in March 1981 with the publication of Volume 1, Number 1. Hopes are high that *FOCUS* will fill any MAA communication gaps, thereby increasing the ability of the Association to serve the needs of its members and of the mathematical community generally. The *FOCUS* Editor and Editorial Committee have my sincere best wishes as they strive to establish this newest member of the MAA family of publications as a vital link in the MAA communications network.

It is my firm conviction that MAA now has a publications program that is well rounded and balanced, fully capable of serving the present needs of the Association.

International Conferences Scheduled

International Congress of Mathematicians, August 11-19, 1982; Warsaw, Poland

There will be four types of activities at the Congress, namely (i) invited one-hour lectures (about 16), (ii) invited 45-minute lectures (about 130), (iii) short communications, and (iv) spontaneous seminars. Each of the one-hour lectures will survey the development of mathematics in some major area.

To receive further information, send three copies of your name and address to: International Congress of Mathematicians, ICM-82, Śniadeckich 8, P.O. Box 137, 00-950 Warsaw, Poland.

The October issue of the *AMS Notices* contains an application form for grants to support travel to the Congress.

International Conference on Teaching Statistics, August 9-13, 1982; Sheffield, England

The objective of this conference is to improve the quality of statistics teaching on a world-wide basis. Key goals include fostering international cooperation among teachers of statistics and promoting the interchange of ideas about teaching materials, methods, and content. Teaching from the school to the college level as well as other forms of teaching will be included.

For further information, write to: ICOTS Secretary, Department of Probability and Statistics, The University, Sheffield S3 7HR, U.K.

Second World Conference on Mathematics at the Service of Man, June 28-July 3, 1982; Canary Islands, Spain

The Conference is divided into eight topics, each with a main lecture, a workshop or panel, and a special session: Advances in Multivariate Statistical Analysis and Econometric Models; "Concrete" Mathematics; Functional Equations—Theory and Applications; Mathematical Methods in Pattern Recognition and Artificial Intelligence; Mathematical Models in Biology and Ecology; Mathematics in Medical Research and Health Services; Measuring "Deviance" in Non-Classical Logics and Modeling; Non-Linear Wave Propagation in Different Media.

For further information, write to: Second World Conference on Mathematics at the Service of Man, Universidad Politécnica de Las Palmas, Casa de Colón, Herrerías, 1, Las Palmas de Gran Canaria, Canary Islands, Spain.

FOCUS

Mathematical Association of America
1529 Eighteenth Street, N.W.
Washington, D.C. 20036