FOCUS

Volume 8, Number 3 THE NEWSLETTER OF THE MATHEMATICAL ASSOCIATION OF AMERICA May–June 1988

More Voters and More Votes for MAA Officers Under Approval Voting

Over 4000 MAA mebers participated in the 1987 Association-wide election, up from about 3000 voters in the elections two years ago. Lida K. Barrett, was elected President Elect and Alan C. Tucker was voted in as First Vice-President; Warren Page was elected Second Vice-President. Lida Barrett will become President, succeeding Leonard Gillman, at the end of the MAA annual meeting in January of 1989. See the article below for an analysis of the working of approval voting in this election.

MAA Elections Produce Decisive Winners

Steven J. Brams

The use of approval voting (AV) in the 1987 elections of a president and two vice-presidents of the MAA for two-year terms beginning in 1989 afforded another test of how approval voting works in practice. In fact, the voting behavior of mathematicians does not appear to differ significantly from that of management scientists and statisticians, who also recently adopted approval voting in their societies. (For a report on elections by The Institute of Management Scientists and the American Statistical Association, see Brams and Fishburn, "Does Approval Voting Elect the Lowest Common Denominator?" PS: Political Science & Politics 21, no. 2 (Spring, 1988.) Also a source for references to other uses of approval voting.)

The votes received by the five candidates in the 1987 MAA presidential election, and each of the three candidates in the two vice-presidential contests, are shown in Table 1 broken down by the votes each of the candidates received from voters casting one vote (1-voters), voters casting two votes (2-votes), and so on. Office by office, I have excluded from these totals and the subsequent analysis the voters who voted for all the candidates (9 voters in the presidential election, 30 in the first vice-presidential election, and 20 in the second vice-presidential election). Such voters demonstrate undifferentiated support for all the nominees, but have no effect on the outcomes of the elections.

In the presidential election, 3,081 of the 3,924 voters (79 percent) were 1-voters, with the remaining 843 voters casting 1,956 votes, or an average of 2.3 votes each. Thus, the multiple voters cast 39 percent of the votes, though they constituted only 21 percent of the electorate.

Mathematics and the Public

Leonard Gilman

Is it possible to enhance the public's appreciation of mathematics and mathematicians? Science writers are helping us by turning out some first-rate news stories; but what about mathematics that is not in the news? Can we get across an idea here, a fact there, and a tiny notion of what mathematics is about and what it is for? Is it reasonable even to try? *Yes.* Herewith are some thoughts on how to proceed.

LOUSY SALESPEOPLE Let us all become ambassadors of helpful information and good will. The effort will be unglamorous (but inexpensive) and results will come slowly. So far, we are lousy salespeople. Most of us teach and think we are pretty good at it. But when confronted by nonmathematicians, we abandon our profession and become aloof. We brush off questions, rejecting the opportunity to explain in any sense what it is we do, what we don't do, and why what we do is important. • Instead, be gracious and helpful, the way you respond to your own children—you don't tell *them* the only way to understand it is in terms of the theory of groups; on the contrary, you bend over backwards to come up with imaginative explanations at their level. So, proceed patiently, one x at a time. In a conversation, stick to one mathematical idea; in a lecture or article, not much more. Keep in mind that the reason the public cannot understand mathematics is that "they are unable to achieve the degree of concentration required to follow a moderately involved sequence of inferences" [David Gale and LLoyd Shapley, AMERICAN MATHEMATICAL MONTHLY, January 1962]. Explain that progress in the modern world cannot take place without mathematical ideas, methods, and skills—and give examples. • At the same time, be agressive. When someone boasts of not being good at math, express sympathy but emphasize that failure at math is a cause for shame, not glory. • Dispel the notion that mathematics consists largely of isolated tricks that are good only as entertainment. And don't tout esoterica or generalize or contradict what your listener doesn't know: if you observe enthusiastically that the sum of the angles of a triangle does not have to be 180°, the response you are apt to get is, "Oh, was it supposed to be 180°?"

(continued on page 5)

Did the multiple voters make a difference? It would appear not, because the victors in all three contests were decisive winners among 1-voters. In the presidential contest, for example, A got 28 percent more votes than the runner-up (D) from these voters, just edged out B among 2-voters, but lost to several candidates among 3-voters and among 4-voters. A's victory, then, is largely attributable to the substantial margin received from 1-voters, not from the presumably more lukewarm support received from multiple voters.

The story is similar in the race for second vice president. Whereas J won by a huge margin among 1-voters, K beat J among 2-voters. Again, it is the apparently more fervent support of 1-voters who elected the winner in this contest.

In the race for first vice president, H won handily among both 1-voters and 2-voters. When a candidate wins among all classes of voters—those who cast few votes (narrow voters) and those who cast many votes (wide voters)—we call such a victor "AV-dominant." If we define wide voters to be any multiple voters, then neither A's nor J's victory in the other two elections is AV-dominant, because neither was the most popular candidate among wide voters.

Does this vitiate their winning status? After all, one fear expressed about using AV is that, while it might elect the most acceptable candidate overall, this candidate might be a kind of lowest common denominator—the second or third choice of many voters but the passionate choice of few (Brams and Fishburn, Approval Voting. Boston: Birkhauser, 1983).

Emphatically, this did not occur in the MAA elections: except for H, who was AV-dominant, the victors won because of their surpassing strength among 1-voters, whose preference intensities would seem to be greatest. (An exception may be the 37 voters who voted for four of the five presidential candidates; it is reasonable to suppose that many of these voters also had intense preferences—but against the one candidate they chose to leave off their approved lists.)

I have drawn Venn diagrams indicating the shared support among the different subsets of candidates (not shown here). In the three-candidate contests, there are few surprises, with the amount of shared support of different pairs of candidates from 2-voters generally in line with the 1-voter support of each member of the pair. Thus, the greatest shared support in each of these contests is between the two front-runners, H and F in the first vice-presidential contest and J and K in the second.

The story is more complex in the presidential race, with 10 subsets of two candidates, 10 of three candidates, 5 of four candidates, and 1 of all five candidates. As Table 1 reveals, 2-voters gave the candidates 22–26 percent of all their votes, 3-voters 10–16 percent, and 4-voters 2–5 percent. A closer look at the sources of this support does not reveal any particular pairs, triples, or quadruples that received unusually great support, indicating that there was not obvious coalitional voting.

On the contrary, multiple votes are spread about as one would expect according to the null hxpothesis that votes are distributed in proportion to the candidate totals. In the case of A, for example, there were 82 shared votes with just B, 91 with just C, 80 with just D, and 23 with just E, which is roughly in accord with the candidates' overall totals. Indeed, every one of the 32 subsets in the presidential election—including abstention (2.6 percent abstained in the presidential election, 5.5 percent in the first vice-presidential election, and 12.6 percent in the second vice-presidential election)—got at least 3 votes.

Across the three elections, 7.6 percent of the voters approved of all three winners, 32.8 percent two of the three, 39.8 percent one nf the three, and 19.8 percent none of the three. Hence, less than 20 percent of the electorate could be said to be totally frustrated by the results.

The biggest surprise, perhaps, is that only about one-fifth of the electorate cast multiple votes in the presidential election, far fewer in the vice-presidential elections. One possible explanation is that there were no instructions to voters on how to vote on the ballot.

I would recommend in future MAA elections that instructions such as the following be printed on the ballot as a reminder: "Vote for all candidates you approve of or find acceptable, which may range from none to all." Judging from the experience of other societies, the average number of votes cast in a 5-candidate election would probably increase from 1.3 in the present election (abstainers as well as 5-voters excluded) to 2 or more.

Whether the additional multiple votes would have elected different candidates is hard to say. But it is abundantly clear that, this time around, the winners did not win simply because of bland support from multiple voters.

Acknowledgments I am grateful to Leonard Gillman, President of the MAA, for his support of approval voting, to the nominees, for supporting the release of the data, and to Kenneth A. Ross, Secretary of the MAA, for providing the ballot data, and Jo Andrews for valuable research assistance.

APPROVAL VOTES IN 1987 MAA ELECTIONS (candidate order randomized)

Candidates	1-Voters	2-Voters	3-Voters	4-Voters	Total
Presidential Election (nine 5-voters excluded; * denotes winner)					
A*	848 (66.9%)	276 (21.8%)	122 (9.6%)	21 (1.7%)	1267 (100%)
B	618 (58.7%)	275 (26.1%)	127 (12.1%)	32 (3.0%)	1084 (100%)
C	652 (60.1%)	264 (25.2%)	134 (12.4%)	34 (3.1%)	1052 (100%)
D	660 (61.0%)	273 (24.4%)	118 (10.9%)	31 (2.9%)	1082 (100%)
E	303 (54.9%)	132 (23.9%)	87 (15.8%)	30 (5.4%)	552 (100%)
Total Votes	3081	1220	588	148	5037
No. of Voters	3081	610	196	37	3924
First Vice-Presidential Election (thirty 3-voters excluded)					
F	1257 (79.3%)	328 (20.7%)			1585 (100%)
G	626 (75.0%)	209 (25.0%)			835 (100%)
H*	1434 (78.1%)	401 (21.9%)			1835 (100%)
Total Votes	3317	938			4255
No. of Votes	3317	469			3786
Second Vice Presidential Election (twenty 3-voters excluded)					
I	413 (83.6%)	81 (16.4%)			494 (100%)
J*	1798 (88.7%)	228 (11.3%)			2026 (100%)
K	1019 (80.2%)	251 (19.8%)			1270 (100%)
Total Votes	3230	560			3790
No. of Voters	3230	280			3510

WASHINGTON OUTLOOK . . .

Kenneth M. Hoffman

Dealing with Congress The Eyes of Science Are Now Open

As the calendar year 1988 got under way, the mathematics community and countless other groups which depend in part on federal resources got their first accurate readings on how they might be affected by the government's fiscal year 1988 budget, which sets spending levels for the period October, 1987 - September, 1988. It had taken almost a full year for Congress to review the President's budget request, hold hearings, pass authorization legislation, attempt to reconcile the sum of authorizations with the need to control the federal deficit, negotiate with the White House, and finally—in a rash of back-of-the-back-of-the-room horse trading—pass a single omnibus appropriations bill totalling the better part of a trillion dollars. One Washington old-timer called the appropriations package "The largest take-it-or-leave-it offer in history." Following the presidential acceptance (signature), another month passed before one could be certain what had happened to the budgets of specific federal agencies in the last-minute congressional crunch.

It took still longer for the scientific community to open its eyes fully and take a good hard look at the harsh realities of the way it had been treated and the uphill battle it will face in the Congress over the next several years. It is worth examining how specific decisions affected the mathematics community and wherein our fundamental problems may lie in years ahead.

Total FY 88 federal support for basic academic research in the mathematical sciences is $121 million, up 5% from FY 87. The percentage increase over the five-year period FY 83 - FY 88 has been 84%, with equal percentages for our two major supporters: 84% at the National Science Foundation (NSF) and 84% at the Department of Defense (DOD). We had projected at an earlier stage 95% over the five years. The difference is accounted for by some $4 million squeezed out here and there in this year's congressional budget process. Support for education at NSF grew by more than 40% from FY 87 to FY 88, with a significant piece going into undergraduate education activities.

The Administration and the authorization committees in Congress had supported more sizable increases for basic research. As we have indicated, when the omnibus appropriations bill was put together, increases disappeared in the back room.

Research support at DOD increased by 6.8%, from $45.7 million in FY 87 to $48.8 million in FY 88. This was slightly less than expected, primarily because of what some people call Proposition 14—an amendment to defense appropriations introduced by Congressman Martin Szabo (5th Minnesota District). This limits to 14% the share of University Research Initiative (URI) monies which can go to any one state. URI's in California and Massachusetts were cut 22% - 34% as a result. Across all disciplines, the FY 88 DOD basic science and engineering research budget must support $108 million of "set-asides"—congressionally-mandated awards to specific people or institutions, by-passing agency and peer review. This figure is up from $5.5 million the previous year. Such pork-barrelling has affected our discipline only a small amount, but is certain to be more of a problem in the future.

The budget road through Congress was even rockier for the NSF budget. The appropriations committees had supported the first 15+% increment in Director Erich Bloch's plan to double the Foundation budget over 5 years, but trouble began early in the appropriations process. Members of our community joined with other scientists, writing their congressmen and senators to impress on them the importance of the NSF budget to the future of science. We had a real impact and we held the line in the appropriations committees through the fall. Then, with no further opportunity for input, the guillotine fell. Final appropriations outcomes were:

NSF Total	up 6%
NSF Research	up 3.3%
NSF Science Education	up 40%

In the face of these "cutbacks" Erich Bloch and his senior staff took several actions. They:

- protected certain areas—the first named was Mathematics
- delayed some FY 88 programs—chiefly Science and Technology Centers
- shifted some programs around—principally, they moved much of the planned increase in undergraduate activities into Science and Engineering Education (where there was money)
- gave lower increases to some directorates, chiefly those benefitting most from increased computation money available elsewhere in NSF.

One of the directorates so squeezed was Mathematical and Physical Sciences, which received only a 2% increase. Assistant Director Richard Nicholson nevertheless took very seriously the commitment to "protect" mathematics, giving the Division of Mathematical Sciences (DMS) a 6% increase, from $59.9 million to $63.5 million. Roughly speaking, this means that our dollar base in DMS stood still from FY 87 to FY 88 while several other sciences went backward. Actually, we are better off than "standing still" would suggest. The reality requires more explanation than can be given here and will be made more clear in forthcoming reports to the community from Division Director Judith Sunley.

What has been the NSF response to the congressional actions? Understandably, there has been frustration and some anger. But the primary response has been increased determination. Erich Bloch, with the backing of the Office of Management and Budget and the President, still says the plan is to double the NSF budget over the next five years. His (and Reagan's) budget for FY 89 asks for a 19% increase for the Foundation. The only new twist is that the Science and Technology Centers will constitute a separate budget category. The request is $150 million for centers, to pay for five years worth "up front." The intent of this move is partly to get a "go or no-go" decision on the centers and partly to keep centers more clearly separated from individual research grants in the NSF budget and decision-making process.

If there is a most basic truth of the situation we and the other sciences now find ourselves in, it is that nothing can be separated from anything, especially in the context of the difficult choices Congress faces. Because of this, several new coalitions of scientific organizations have been formed to put to Congress in a more unified manner the case for support of basic research. It is far too early to tell how effective they will be. What is certain is that things will get worse before they get better. Questions of scientific priorities plague us, especially those about "big science" versus "small science." These are real and important issues, but far from the toughest we face. Most perplexing are the issues of science versus other social programs. It is here most of all that we need to have our eyes wide open.

(continued on page 4)

Dealing With Congress *(continued from page 3)*

In the final appropriations decisions regarding the FY 88 budget, science was not squeezed as much by other science as by housing for the elderly, veterans benefits, and other programs which directly benefit millions of individual citizens. Furthermore in anticipation of the FY 89 budget process the pressure has moved from the appropriations arena into the authorization arena. In future columns in this space, we will talk about specific issues and strategy decisions the mathematics community faces in relation to Congress. For now, it is enough to convey the deep seriousness and the general nature of the "confrontation" which is shaping up. There is no better way to do this than to quote Congressman Robert Roe (D-NJ) who replaced Don Fuqua as Chairman of the House Committee on Science and Technology, which authorizes budgets for the National Science Foundation, the National Aeronautics and Space Administration (NASA), and several other science agencies. On February 23, 1988 this long-term supporter of science said of the President's FY 89 budget:

"I must call to your attention that the figures simply do not add up. Under the summit bugdet agreement [last fall, between the Congress and the White House], domestic discretionary spending is to increase in fiscal 1989 no more that $3 billion—from $145.1 billion to $148.1 billion. Yet we have before us a series of R&D budget increases which, for three agencies alone, add up to well over $3 billion; $2.5 billion for NASA, $400 million for the Department of Energy, and $300 million for NSF, for a total of $3.2 billion.

"Such sums can be provided only if the congress not only agrees with the proposed priorities and reductions for domestic discretionary spending but makes further reductions in those programs. It assumes that such [Administration] proposed reductions as the elimination of the Economic Development Administration, the cuts in the Agricultural Commodity Price supports, the elimination of Urban Mass Transit Grants, the privatization of Waste Treatment Plant Construction, and the cuts in the Food Stamp program will be accepted.

"In a Presidential election year, neither Democrats nor Republicans in the Congress are likely to go along with anything of the kind. We therefore have a federal budget proposal for research and development which, to borrow a phrase from the Iowa caucuses four years ago, can be at best called an excerise in Voodoo R&D budgeting."

In Memoriam

Lynn Bateman, died March 1988, at the age of 37. She was an MAA member for 2 years.

Ralph W. Klopfenstein, Fellow Technical Staff, RCA Laboratories, died November, 1986, at the age of 63. He was an MAA member for 34 years.

Bert Mendelson, Professor, Smith College, died January, 1988, at the age of 62. He was an MAA member for 28 years.

William H. Pell, retired, died 14 March, 1988, at the age of 73. He was an MAA member for 35 years.

J. N. Rice, Associate Professor, Catholic University of America, died 9 January, 1988, at the age of 97. He was an MAA member for 68 years.

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

Edward Carson, Instructor, Allegheny Community College; **H. E. Hadlock**, Professor Emeritus, Univesity of Florida at Gainesville; **Brenda Michaels**, Program Analyst, U.S. Navy.

More Bylaw Changes

The job of Secretary of the MAA is very time-consuming. Roughly half of the duties of the Secretary involve meeting arrangements. The Board of Governors recommends that there be an Associate Secretary, who will be responsible for arranging meetings. As recommended by the Board, the Associate Secretary would be an elected member of the Board of Governors, but would not be an Officer of the Association nor a member of the Executive Committee (or Finance Committee). The Associate Secretary would be an ex officio member of the Committee on Meetings. The length of office would be five years. For the implementation of the new office, the first Associate Secretary would serve a 3-year term (1990–1992). Subsequent Associate Secretaries would serve 5-year terms.

In order to create an Associate Secretary, the Board of Governors recommends the following bylaw changes. They will be submitted to the membership of the Association at the Business Meeting in Providence at 4:30 p.m. on Tuesday, August 9, 1988, and will become official provided they receive at least a two-third (⅔) vote of those present at the Business Meeting and entitled to vote. Text to be added is underlined.

III.2 There shall be a Board of Governors (herein called "the Board") to consist of the officers, the ex-presidents for terms of six years after the expiration of their respective presidential terms, the Associate Secretary, the Editor of each of its three publications entitled . . . .

IV.1(c) The Board shall elect annually two Governors for terms of three years and at appropriate times by ballot and for terms stated: an Editor of THE AMERICAN MATHEMATICAL MONTHLY, an Editor of THE COLLEGE MATHEMATICS JOURNAL, an Editor of MATHEMATICS MAGAZINE, a Secretary, an Associate Secretary, and a Treasurer each for five years, and two members-at-large of the Finance Committee for four years. In even-numbered years the Board shall elect one of the current editors to be a member of the Executive Committee for a two-year term beginning on January 1 of the next year.

IV.5 (a description of the duties of the Secretary) should be changed to IV.5(a). Then add:

IV.5(b) The Associate Secretary shall be responsible for arrangements of national meetings of the Association. The Associate Secretary shall not be an Officer of the Association nor a member of the Executive Committee.

At the present time the bylaws require a slate of five candidates for the office of President and three each for the offices of First Vice-President and Second Vice-President. The 1987 Nominating Committee found that, in trying to put together a slate of five candidates for President, it was considering people who at this stage of their careers would perhaps be more suitable as candidates for Vice-President. Nominating such a person for President at this stage, with a small chance of winning, could effectively bar the person from running for Vice-President in the future and could end up diminishing the chances of such a person ever becoming President. It is also awkward for candidates to be nominated for President several times without being elected. For these reasons, the 1987 Nominating Committee recommended that the bylaws be changed so that only three candidates for President are required. Accordingly, the Board of Governors endorsed the following bylaw change. A word to be inserted is underlined and words to be deleted are striked over.

IV.2(b) For the general election the Nominating Committee shall prepare printed ballots with five or more nominees for President-Elect and three or more nominees for each other office to be filled by the members. Blank spaces on the ballot shall be provided for write-in votes. [The article goes on to explain the voting procedure]

FOCUS 1987 MAA ANNUAL REPORT

President's Message

Leonard Gillman

This report consists of brief remarks on three important topics.

RESEARCH MATHEMATICIANS A year ago in this column I called for closer ties with the research community, inviting research mathematicians to join the Association and participate in committee activities and other MAA affairs. As though in response, the American Mathematical Society has become increasingly visible in matters of undergraduate education. I don't know that research mathematicians are suddenly joining the Association in unusually large numbers—but what counts is their participation one way or another. Here are two examples. (i) AMS recently expressed interest in joint committee work on the undergraduate curriculum; in response, we added two AMS nominees to the MAA Committee on the Undergraduate Program in Mathematics (CUPM). (ii) The recognition that there is no appropriate journal for reporting teaching experiments led to a proposal for a joint AMS-MAA newsletter on collegiate mathematical education—about which there will be more to say a little later in the year.

PUBLICATIONS Our publications program is being pursued with vigor. The new SPECTRUM series of books has been launched, with two titles in print and a half-dozen in the works. Don Albers, chair of the Committee on Publications, took personal charge to get SPECTRUM going. This series will offer a wide selection intended to appeal to people outside mathematics as well as provide light reading for mathematicians. The works will tend to be about mathematics and mathematicians rather than consist of technical treatises; the first two are MATHEMATICS: QUEEN AND SERVANT OF SCIENCE, by Eric Temple Bell, and I WANT TO BE A MATHEMATICIAN, by Paul R. Halmos, both reprintings from earlier editions with other publishers. With SPECTRUM now successfully underway, Albers has passed the editorship to James W. Daniel, a member of the MAA Committee on Publications and Vice President of SIAM for College and University Activities.

The NOTES series will have a new look. Originally, it was considered primarily as a vehicle for disseminating educational information of interest to MAA members, and seven of the first eight volumes were reports on curriculum or staffing. The exception was No. 4, the lecture notes by Carl Pomerance on his short course at Kent State on primality testing and factoring; the new emphasis will be in this direction of lecture notes on mathematics. The main point about NOTES is of course that they are informal and can be put out quickly. (No. 8, CALCULUS FOR A NEW CENTURY, must have set a record: it reports the conference held October 28–29, 1987 and went on sale January 6, 1988 at the Atlanta meeting.) NOTES also has a new editor, Warren Page, the retiring editor of THE COLLEGE MATHEMATICS JOURNAL.

STUDENT CHAPTERS The plans for introducing MAA student chapters have been worked out. These chapters are not intended as an honor society but as a means to create, organize, and sustain interest in mathematics among college students, not necessarily even mathematics majors. The actual formation and chartering of chapters will get underway in the fall. The Sections will help its chapters get started and will work closely with them. Eventually we can expect each Section to add a Student Chapter Coordinator to its roster of officers; this person would keep tabs on the chapters, act as a clearinghouse of information, and stimulate student papers at section meetings. To smooth the flow of information at the national level, Howard Anton and David Ballew, the chairs of the Committee on Student Chapters and the Committee on Sections, respectively, have each been appointed to the other committee.

Keys To The Future

Alfred B. Willcox
Executive Director

One year ago, I stated in my report that 1986 was the year the MAA emerged from the seventies and entered into the nineties. Thus, 1987 was to be the first year of a new MAA, the MAA of the nineties. One year later, I see no reason to change my analysis—the Association had indeed turned the corner and now looks to the future for inspiration rather than the past.

It is often said that a marriage, another kind of commitment to the future, often experiences its strongest test in the first year. I do not know whether this conventional wisdom applies to organizations, but our experience suggests that it does. Nineteen hundred eighty-seven was not only a year of new vitality for the MAA, it was also a year of some stress. In this report I will describe some of the vitality and some of the stress. It is my conviction, then, that in dealing with the stress—successfully, I hope—we will build a strong base for the MAA of the nineties. In the selected 1987 highlights that follow, I will not dwell on the ups and downs. Like a subtle Chinese sauce, each is a mixture of sweet and sour that is more exciting than the constituent parts.

PUBLICATIONS Under the guidance of Associate Director Peter Renz, the MAA publication program has begun to gather steam. Nine new books and reports were published in 1987. They have been received with enthusiasm and sales have been brisk. The Association received income of nearly $400,000 from the sale of 36,000 copies of MAA books in 1987 and sales in the first quarter of 1988 were up ten percent over the same period in 1987. Director Renz has opened new

Keys to the Future *(continued from page i)*

publications vistas for the Association through such acquisitions as Martin Gardner's RIDDLES OF THE SPHINX and E. T. Bell's classic, MATHEMATICS: QUEEN AND SERVANT OF SCIENCE. The report, CALCULUS FOR A NEW CENTURY, is a hot item on the newsstands, having been published by the MAA only two months after the conference by the same name. President Gillman's WRITING MATHEMATICS WELL sold out during its first year and is now being revised and reprinted. Even our traditional, mainline publications seemed to have acquired a new life—STUDIES IN THE HISTORY OF SCIENCE and STUDIES IN MATHEMATICAL ECONOMICS are setting new records for this prestigious series. More fascinating titles are in the pipeline.

Design has been a priority this year, affecting both books and journals. Mathematics Magazine has been redesigned inside and out, and our recent books have taken on an appealing contemporary look.

MEMBERSHIP Membership increased again in 1987, though not as dramatically as in 1986. The intense promotional effort of 1986 could not and should not be sustained for a long period. Nineteen hundred eighty-seven was a year to catch our breath. Nevertheless, membership on January 1, 1988 was, at 26,269, forty-one percent higher than on January 1 five years earlier. We continue to grow.

PROJECT FUNDING In 1987, the MAA received 15 foundation grants or corporate contributions totaling nearly $700,000 in support of special projects. Some, like Women and Mathematics and the USA and International Mathematical Olympiads, were ongoing projects. Others, like the new American Mathematics Project (to help create 20 new, local teacher-support projects in the US), AIM (a high school, multimedia learning materials project), training of teaching assistants and part-time instructors, and a project to develop a motivational video for mathematics students, are special projects with limited time spans. This establishes a record over more than a decade for corporate and foundation support of MAA projects. Moreover, the rate of submission of grant proposals has increased during the past 12 months, reaching an all time high in the first three months of 1988. If our success rate holds steady, our project funding should remain strong for at least three years.

STUDENT CHAPTERS A new committee worked through 1987 to plan for the inauguration of MAA student chapters on college and university campuses. An announcement will be made in April 1988, and we expect to charter the first student chapter in January 1989. We hope that these chapters will help revitalize student interest in mathematics as a discipline and as a career.

WOMEN & MINORITIES IN MATHEMATICS We were sad to see one of our important projects, Blacks and Mathematics (BAM), come to the end of its funding in 1987. BAM has taken a rest for awhile, but the rest does not spell the end of MAA intervention on behalf of blacks. An MAA Task Force on Minorities in Mathematics is studying how the MAA can best use its unique resources to help all minorities gain access to education and professional careers in mathematics. The Task Force plans to present an action report to the Board of Governors next January. Women and Mathematics (WAM) continues to thrive despite the limitations of available funding. Here is an oppnrtunity for public-minded corporations to contribute to successful, but financially strapped programs, to help women and minorities achieve professional equity.

BUDGET In my 1986 Annual Report, I wrote of the growing need for strong budget planning and control. This need was further dramatized by the negative financial balance in 1987. However, 1987 was also a year of intense analysis of our budgeting procedures. I am happy to report that measures have been put into effect which will bring project managers into more active participation in the budgeting procedure and which will give them both the means and the responsibility to review budget performance periodically. The Finance Committee reviews the long-range priorities of the Association each year to ensure that our budget reasonably reflects our constitutional purposes. The committee and staff are working together to find means to broaden the Association's financial base.

HEADQUARTERS BUILDING For several years our building managers have been warning us that our handsome but aging building was in need of major renovation. To clarify the issue, in the spring of 1987 we ordered a thorough architectural survey of our headquarters complex. In a fifty-page report, the architects informed us that the buildings are indeed in immediate need of major exterior and interior renovation to correct roofing, heating, plumbing, and electrical deficiencies. The estimated cost substantially exceeds the purchase price of the property in 1978. Compounding the problem, our major tenant has left us for larger more modern quarters, making a certain amount of interior renovation an immediate necessity.

On the other hand, in 1988 the buildings are worth five times what we paid for them in 1978, an amount that would purchase a new building of the same size in suburban Washington. The Executive and Finance Committees and staff of the Association have joined in an intensive six-month study of the available options for future headquarters facilities. The Board of Governors will be asked to select one of these options at its meeting next August. The issues are complex and the stakes are high. The outcome of a wise decision will be a strong, affordable, strategically-located headquarters facility for the 1990's.

In 1987 the Association's vital signs were strong, indicating robustness and growth despite the constraints of a tightening budget and the complications of an aging headquarters home. We have much to celebrate and much to do to solidify our new vitality. Paraphrasing the slogan of the 1986 Tulane Calculus Conference, our theme for the nineties might be Toward a Lean and Lively MAA!

The 1987 Mathematical Association of American Executive and Finance Committees at Washington Headquarters: (from left to right) Back Row: Gerald L. Alexanderson, Ann E. Watkins, Lynn A. Steen, Donald L. Kreider, Gerald J. Porter, and Alfred B. Willcox. Front Row: Lida K. Barrett, Leonard Gillman, Kenneth A. Ross, Deborah T. Haimo, and Marcia P. Sward.

Committees on Curriculum and Teaching

Committee on the Undergraduate Program in Mathematics

Subcommittees of CUPM continue to pursue investigations of various aspects of the undergraduate curriculum in mathematics.

The Subcommittee on Curriculum at Two-Year Colleges chaired by Ronald Davis is in the final stages of its study, and will soon issue a report.

The joint CUPM-CTUM Subcommittee on Service Courses chaired by Donald Bushaw has completed a survey of biologists, and is planning surveys of other disciplines. Martha Siegel represented the Subcommittee at a workshop on services courses sponsored by the International Commission on Mathematical Instruction (ICMI) in Udine, Italy. This Subcommittee is now a standing Subcommittee of the Association.

The Subcommittee on the First Two Years of College Mathematics prepared a proposed set of specifications for a mathematics calculator suitable for use in freshman and sophomore courses; this proposal has been discussed with representatives of calculator companies, and has been sent to all the major calculator manufacturers. The Subcommittee also began a series of site visits to campuses in order to discuss curricular issues with those affected by mathematics. Thomas Tucker has succeeded Richard Anderson as chairman of this Subcommittee.

A Subcommittee on the Major in the Mathematical Sciences chaired by Bettye Anne Case was appointed and has begun its work.

CUPM has maintained communication with the joint MAA-NCTM Task Force on Mathematics Curriculum in Grades 11–13 chaired by Joan Leitzel, the NRC Calculus Project Steering Committee chaired by Ronald Douglas, and the NRC Project MS 2000 chaired by Bernard Madison. Current plans include outreach to curriculum committees in the scientific and engineering professional societies, additional campus visits, and development of a series of "scenarios" concerning the dominant themes that emerge from the current calculus experiments.

The membership of CUPM has been expanded to include representatives of AMS and SIAM. Lynn Steen has succeeded Jerome Goldstein as chairman of CUPM.

Committee on the Teaching of Undergraduate Mathematics

CTUM and CUPM are sister committees with shared concern for the "how" and "what," respectively, of college mathematics instruction. CTUM was formed in 1977 and soon thereafter became a standing committee of the MAA. CTUM produced the pamphlets College Mathematics: Suggestions on How to Teach It and Training Programs for Teaching Assistants in Mathematics, the first volume in the MAA Notes series, Problem Solving in the Mathematics Curriculum, the Report on Discrete Mathematics in the First Two Years, and the recent MAA Notes Volume Teaching Assistants and Part-Time Instructors: A Challenge.

CTUM's Source Book for College Mathematics Teaching is scheduled for completion in 1988. It will cover: Goals for Instruction, Priorities and Resources, Placement, Advising and Student Responsiblities, Suggestions for Teaching, Notes on TA's and PTI's, and Evaluation of Students and of Instruction.

Alan Schoenfeld chairs CTUM Subcommittee on Reasearch. Schoenfeld edited the proceedings of the conference "Cognitive Science and Mathematics Education" in which this subcommittee was involved and these were published by Lawrence Erlbaum in 1987. See the March 1988 JOURNAL FOR RESEARCH IN MATHEMATICS EDUCATION for a review.

A related conference with subcommittee involvement has been funded by NSF and the A. P. Sloan Foundation and will deal with issues in college level mathematics teaching.

Don Bushaw chairs the CTUM subcommittee on the evaluation of teaching—a critical area for the status of the profession as well as the improvement of mathematics education. This subcommittee has conducted a survey to determine current practices. In 1988 the subcommittee expects to complete its analysis and produce its final report covering current thinking, research, and practices in the evaluation of teaching, specifically as these apply to undergraduate mathematics.

Don Bushaw also chairs the joint CTUM-CUPM Subcommittee on Service Courses whose activities are reported under CUPM's activities.

Training of Teaching Assistants and Part-Time Instructors

TEACHING ASSISTANTS AND PART-TIME INSTRUCTORS: A Challenge was published in 1987 and is currently available from the MAA; it includes summary data about TAs from a 1985 survey report. A reference manual to help those invloved in training programs for teaching assistants or part-time instructors is being prepared for Fall 1988 publication. At the January, 1988 panel discussion in Atlanta, preliminary information from the new survey was presented and plans announced for a January, 1989 minicourse at Phoenix.

The attention of the project, its publications and presentations, is to the broad spectrum of concerns associated with teaching by other than regular faculty. The Committee must sometimes deal with intense negative attention from politicians, parents, students, and the media to the "foreign TA situation." Other than necessary training in spoken English, only programs with primary involvement of the academic unit and which involve all TA/PTI are recommended. The Committee feels a responsibility to try to prevent foreign TAs from being made scapegoats for problems in American education. Effective training programs for assimilating all TA/PTI into the appropriate academic community are the focus of the project.

Bettye Anne Case, The Florida State University, directs the project which is largely funded by a grant from the Comprehensive Program of the Fund for Improvement of Postsecondary Education, U.S. Department of Education. Committee members are Tom Banchoff, Phil Huneke, and David Kraines. Project staff are Annette Blackwelder and Moana Karsteter.

The Mathematical Education of Teachers

COMET, the Committee on the Mathematical Education of Teachers, has continued the work of CUPM's Teacher Training Panel. In 1987 COMET's recommendations based on the Holmes Group's TOMORROW'S TEACHERS and the Carnegie Forum's A NATION UNPREPARED: TEACHERS FOR THE 21st CENTURY were brought to the MAA Board of Governors and approved. SEE FOCUS, September 1987, pages 5 and 6. With this action the MAA adds its important voice to those calling for reform in teacher education and the status of the teaching profession. Also during 1987 COMET continued its work on a set of guidelines for the continuing education of teachers. This report will be published in the MAA Notes series in 1988, where it will join the volume on preservice mathematical training of teachers, RECOMMENDATIONS ON THE MATHEMATICAL PREPARATION OF TEACHERS.

MAA Committees

In early 1988 the MAA received a 1987 bequest of about $250,000 from Edyth May Sliffe, to endow prizes to outstanding high school mathematics teachers. The award is named after Ms. Sliffe. The new Edyth May Sliffe Award Committee is chaired by Henry L. Alder, University of California, Davis.

Since April 1987, six other standing committees have been appointed: Committee on Mathematicians Outside Academia (chair: Daniel P. Maki, Indiana University); Committee on Student Chapters (chair: Howard Anton, Drexel University); Committee on Faculty Development (chair: John A. Dossey, Illinois State University); Technical Advisory Committee (chair: Ronald M. Davis, Northern Virginia Community College); CUPM Subcommittee on the Major in the Mathematical Sciences (chair: Bettye Anne Case, Florida State University); and the Subcommittee on SPECTRUM (Subcommittee of the Publications Committee) (chair: Donald J. Albers, Menlo College).

Six ad hoc committees were established: The Nominating Committee for Secretary (1990–1994) and Associate Secretary (1990–1992) (chair: James W. Daniel, University of Texas); Committee on Awards (chair: Deborah Tepper Haimo, University of Missouri, St. Louis); Committee to Study the Feasibility of a Capital Fund Drive (chair: Donald L. Kreider, Dartmouth College); Task Force on Minorities in Mathematics (chair: Louise A. Raphael, National Science Foundation); Advisory Committee on Printing Design (chair: Sanford L. Segal, University of Rochester); Committee on Financial Management (chair: Felix Haas, Purdue University).

In conjunction with the American Mathematical Society, the MAA appointed the Advisory Committee for AMS-MAA Newsletter on Collegiate Mathematics Education (chair: Joseph A. Gallian, University of Minnesota, Duluth; and editor: Ed Dubinsky, Purdue University).

Some major committees have new chairs: Lynn A. Steen of St. Olaf College has replaced Jerome A. Goldstein as chair of CUPM, the Committee on the Undergraduate Program in Mathematics; Leo J. Schneider of the John Carroll University has replaced Stephen B. Maurer as chair of CAMC, the Committee on the American Mathematics Competitions; John A. Thorpe of SUNY at Buffalo has replaced Henry O. Pollak as chair of MAA Science Policy Committee.

Committee on Sections

Year after year, the twenty-nine MAA Sections prove themselves to be a very important part of the professional lives of MAA members. In 1987 over 4500 attended a Section meeting and heard over 750 papers. Over three-fourths of the Sections now provide mini-courses, workshops, and summer seminars to help keep members mathematically alive and current (a total of 45 mini-courses, workshops, and summer short courses were reported on by 23 of our 29 Sections).

Several Sections have been very active in government, moving their legislatures and policy boards to better mathematical education. Many Sections have advanced the MAA's goal of increasing public understanding and appreciation of our discipline. There has been increased undergraduate student participation (170 of the 750 Section presentations were by undergraduates).

It might be noted that more MAA members attend a Section Meeting than attend the two National Meetings combined. Some have said that the grass roots participation of Sections is the lifeblood of the MAA and the factor that gives the MAA its uniqueness and strength.

David W. Ballew, Professor and chairman, Department of Computer Science, Western Illinois University, served as chairman of the MAA Committee on Sections during 1987.

MAA Projects on Testing

The MAA Committee on Placement Examinations (COPE) develops, revises and maintains the placement tests in the MAA's mathematics examination series and contributes to the resolution of the testing issues that are of increasing importance to the collegiate mathematical community.

The MAA's Placement Test Program (PTP) has six test areas from arithmetic skills to calculus readiness. Over 416 institutions subscribe to the program which provides reproduction for one year any or all of the tests, a subscription to the Placement Test Newsletter, a copy of the PTP's User's Guide, and a consulting service.

COPE members frequently make presentations about testing information and other issues at national meetings. One such effort in 1987 was a joint symposium with The College Board on "Calculators on the Standardized Testing of Mathematics." This was a first step in an in-depth contribution that COPE is making to calculator and mathematical testing issues. The effort is funded through a multi-year grant from Texas Instruments, Inc. and to date $60,000 has been received by the MAA in this program. COPE members are also working closely with the development staff at Texas Instruments as educational consultants with advice about the future technology needs of the mathematics educational community.

This initial association with Texas Instruments has grown to include an additional $25,000 grant in 1987 to the MAA to develop a motivational video to increase students' interest in mathematics. The video production is under the direction of John Kenelly, committee chair, and has the cooperation of the National Council of Teachers of Mathematics. Its advisory committee also includes individuals associated with the Square One productions and the MAA's TEAM and AIM projects.

In addition, COPE has organized its basic test production with an extensive test development file. The PTP tests are developed with a special method of formula-based distractors and parallel test forms are structurally and statistically parallel. This method is an exclusive process with the MAA program and its puts COPE in a unique position to incorporate new publishing technologies into multiple test form production. It is now possible for COPE to automate the production of parallel test forms and to incorporate many new technologies into the test production program.

75th Anniversary Committee

A special committee has been established by the MAA to plan for the 1990 summer meeting in Columbus, Ohio. That meeting will commemorate the 75th year of the founding of the Association that took place at a 1915 meeting of the American Association for the Advancement of Science in Columbus on the campus of Ohio State University.

Gerald L. Alexanderson, The Michael and Elizabeth Valeriote Professor in Science at Santa Clara University and editor, MATHEMATICS MAGAZINE, is chairman of the committee.

Student Chapters

The Board of Governors approved a comprehensive plan to establish MAA student chapters at institutions throughout the country. Procedures for coordinating activities of the Committee on Student Chapters with the Committee on Sections and Pi Mu Epsilon are being explored. Application materials will be mailed to institutions in the fall of 1988. The first student chapters could be in place by January, 1989.

Celebrating Achievements, New and Old

American Mathematics Competitions and the Mathematical Olympiads: 1987

The American Mathematics Competitions experienced another very successful year—379,956 high school students and 226,075 middle school students participated in these special examinations. 4200 students qualified for the American Invitational Mathematics Examination, as opposed to 3000 in 1986, the previous high.

Six U.S. and two Canadian students won Olympiad medals in the Sixteenth USA Mathematical Olympiad (USAMO) in which 93 students competed in a rigorous examination designed to test ingenuity as well as knowledge of mathematics. The USAMO competitors were the top performers in two earlier competitions, the American High School Mathematics Examination (AHSME) and the American Invitational Mathematics Examination (AIME) which were held in high schools throughout the United States and Canada in March.

The eight USAMO winners were: Matthew M. Cook, Evanston, IL; Samuel K. Vandervelde, Amherst, VA; Ravi D. Vakil, Etobicoke, ONT; Jeremy A. Kahn, New York, NY; Daniel J. Bernstein, Bellport, NY; William A. Schneeberger, Oklahoma City, OK; Elizabeth Lee Wilmer, Scarsdale, NY; and Rocky Lee, Scarborough, ONT. Ms. Wilmer is only the second young lady to be among the winners. All were honored in June in Washington, D. C. in ceremonies at the National Academy of Sciences.

Four of these winners and 20 other high-scoring students subsequently participated in an intensive four-week training session at the U. S. Military Academy at West Point. The purpose of the training session was to train a U.S. team of six students for the 1987 International Mathematical Olympiad (IMO) held in Havana, Cuba in July and to prepare promising students for future IMO's.

Students named to the U.S. team were: Jordon Ellenberg, Potomac, MD and Eric Wepsic, Boston, MA, both of whom received first prizes with perfect scores of 42 points; Robert Southworth, Winchester, MA, William Schneeberger, Oklahoma City, OK, and John Woo, Pepper Pike, OH, who won second-place prizes with scores of 38, 36 and 32 respectively; and Matthew Cook, Evanston IL who won a third prize with a score of 30. The Americans had a team score of 220 points out of a possible 252. Ahead of them were teams from Romania (250), West Germany (248), USSR (235), and East Germany (231). The American team was a young team, only one member was a 12th grader, and it was the first time since our first participation in the IMO that no team member had the experience of previous IMO participation.

The Mathematical Olympiad activities are sponsored by eight national associations in the mathematical sciences with administration conducted by the MAA. Financial support is provided by both public and private agencies including IBM, the Army Research Office, the Office of Naval Research, and Hewlett-Packard.

MAA Prizes and Awards

Several mathematicians received special recognition at the Atlanta meeting in January 1988. Murray S. Klamkin, University of Alberta, was presented the Award for Distinguished Service to Mathematics in recognition of "his contributions to the realm of problem solving . . . his inspiring influence on young problem solvers, and . . . his many other contributions to mathematics." Stephen Smale, University of California at Berkeley, was presented the Chauvenet Prize for his paper "On the Efficiency of Algorithms in Analysis," BULLETIN of the American Mathematical Society, 13 (1985), 87–121.

Five authors were recognized for excellence in expository writing. The Carl B. Allendoefer Awards for articles in MATHEMATICS MAGAZINE: Israel Kleiner, York University, Ontario, for "The Evolution of Group Theory" and Paul Zorn, St. Olaf College, for "The Bieberbach Conjecture." The Lester R. Ford Awards for articles in The AMERICAN MATHEMATICAL MONTHLY: Stuart S. Antman, University of Maryland, for his review of Ann Hibler Koblitz's A CONVERGENCE OF LIVES—SOPHIA KOVALEVSKAIA: Scientist, Writer, Revolutionary; Joan Cleary and Sidney A. Morris, both of La Trobe University, together with David Yost of Australian National University, for "Numerical Geometry—Numbers for Shapes;" Howard Hiller, Citicorp Investment Bank, New York, for "Crystallography and Cohomology of Groups;" Jacob Korevaar, University of Amsterdam, for "Ludwig Bieberbach's Conjecture and its Proof by Louis de Branges;" and Peter M. Neumann, Queen's College, Oxford, for his review of Harold M. Edwards's GALOIS THEORY. The George Polya Awards for articles in THE COLLEGE MATHEMATICS JOURNAL: Irl C. Bivens, Davidson College, for "What a Tangent Line is When it isn't a Limit" and Constance Reid, San Francisco, California, for "The Autobiography of Julia Robinson." Finally, the Merten M. Hasse Prize which is not restricted by journal but rather by age—the author must have been under forty at the time of publication: Anthony Barcellos, Davis, California, for "The Fractal Geometry of Mandlebrot."

See "Meritorious Service Awards" on pages 6 and 7 of this issue of FOCUS for other awards presented in 1987.

Applications in Mathematics

Applications in Mathematics (AIM) is an MAA project which is conducted primarily by Oklahoma State University. AIM is funded by a $742,000 grant from the National Science Foundation and produced by Professors Jeanne Agnew and John Jobe.

The purpose of AIM is to provide curricular materials in applied mathematics to high school students in the United States. The AIM materials are being presented in six Learning Modules, each Module being a coordinated package of video cassette, student/teacher resource book, and computer software.

Each module features a problem that arose in a particular industry and that can be solved using high school mathematics. The industrial mathematician who actually worked with the problem makes the presentation in an on-site video interview, and later gives a solution. The problem is presented in written form in the Student Resource Book. The Teacher Resource Book describes a variety of ways in which an AIM learning module can be used, along with a detailed solution to the problem. Enhancing the video and written parts of the module is a computer diskette that provides a solution and a chance to explore the problem further through "What if . . . ?" questions.

Six modules are now available: A Backwater Curve for the Windsor Locks Canal; Pricing Auto Insurance; Testing Surface Antennas; Routing Telephone Service; Capturing a Satellite; and Volcano Eruption Fallout. These modules have now been rented into over 5,000 high schools.

Write to the MAA AIM Dissemination Clerk at MAA headquarters in Washington, D.C. for more information and an order form.

Calculus: 1987 and Beyond

In 1986 the Sloan-sponsored conference at Tulane University started the MAA on the path TOWARD A LEAN AND LIVELY CALCULUS. These efforts were unfinished by an MAA committee that later led to the MAA/National Research Council Calculus Course Task Force. This Task Force, with Sloan support, sponsored the conference in October 1987, whose proceedings were published as MAA Notes 8, CALCULUS FOR A NEW CENTURY (January 1988). The Conference was attended by more than 700 people and over 2000 copies of the proceedings were in readers' hands as this report went to press.

This joint MAA/NRC Task Force reviewed progress early in 1988 and noted that much had been accomplished but much remained to be done. The Task Force then agreed to continue to promote new ideas and debate and to facilitate the flow of information on calculus reform. Much of this will be accomplished by the Task Force members individually, acting as a resource for meetings and workshops. Since many follow-up activities are being planned by other groups such as CUPM and MS 2000, the Task Force will be content to monitor and fill gaps at present.

Participation of Women in the MAA

The MAA, in its concern about the increased need for participation of women in MAA programs and activities, established a Committee on Participation of Women. Its first goal is to study the current participation of women in the MAA and to make recommendations to the Board of Governors.

Recent surveys of the Combined Membership List indicate that women constitute about 23% of the MAA. In 1987 about 20% of Americans who received a Ph.D. in mathematics were women and about 46% of women who received bachelors' degrees. In mathematics departments that confer only bachelor's or master's degrees women are 24% of the Assistant Professors and 9% of the full professors. In those granting the doctorate they are 15% of the Assistant Professors and 3% of the full professors.

At the Section level, over the past three years, women presented about 17% of the 753 papers at MAA Section meetings, and 25% of the student papers. David Ballew, a member of the committee and chairman of the Committee on Sections, has appealed to each Section to appoint an "Encourager" to "encourage the new faculty, women, and all minorities to participate in all of the Section's activities."

At the national level, women are active and visible at the highest levels. Eight of the 38 members holding four or more national committee appointments are women, or 21%. However, only 16% of all committee members are women. If the seven committees that were formed because some groups are underrepresented in mathematics are discounted, only 11% of those serving on the remaining 123 national committees are women.

Publication statistics are no better. For the past four years, the best report is that 8% of the reviews in THE MATHEMATICS MONTHLY were written by women. Only one major article in the past four years was written by a woman. Eleven women co-authored articles with men, so about 6% of the 176 authors were women. From the beginning of 1984 until this past May about 6% of the Articles in the MATHEMATICS MAGAZINE were written by women and about 7% of those in THE COLLEGE MATHEMATICS JOURNAL.

The Committee seeks ways to change structures, habits, expectations, and subconscious acts that result in women being so underrepresented in MAA activities compared to their percentage of the membership. It hopes to find both tiny and significant steps that the MAA can take to promote the participation of women in mathematics.

Women and Mathematics

Women and Mathematics (WAM) is a program whose goal is to encourage greater participation of women in the mathematical sciences. WAM, sponsored by the MAA, serves women who are pursuing careers which demand sound preparation in mathematics to speak about their work and the role that mathematics plays in it. WAM completed its twelfth year of operation in 1987.

WAM now covers 16 regions of the country: Baltimore/Washington; Chicago Area; Connecticut; Greater Philadelphia; Greater Texas; Kansas City; Michigan; Montana; New York/New Jersey; North Texas; Northern California; Oregon; Puget Sound Area; Southern California; Utah; and Hawaii.

In 1987 over 300 school visits were made. Speakers talked with approximately 19,000 students, 1,400 teachers and 1,400 counselors, parents, and other adults. By conservative estimates, the total participation in WAM in the first twelve years is over 227,000: 201,000 students, and 26,000 teachers, counselors, parents, and other adults, with over 2,600 school visits.

During 1986–87 WAM received grants totaling $29,000 from the George I. Alden Trust, The Dow Chemical Foundation, GTE, Hewlett-Packard, International Business Machines; Pfizer, the Tektronix Foundation, and Wells Fargo Foundation.

Carole Lacampagne, Northern Illinois University, is the National Director of WAM.

Minorities in Mathematics

In 1987 the MAA established a Task Force on Minorities in Mathematics. A previous Blacks and Mathematics program operated for about 12 years. The MAA has now made the crucial decision to establish a working group to look at the broader issue of minorities in mathematics. The Task Force includes 40+ members composed of Blacks, Hispanics, Native Americans, and others.

The Task Force's work has taken a three-tiered approach: (1) a look inward at the MAA's structure and operations to assess how existing resources can best be used to address the problem and a search for ways to increase MAA minority membership; (2) a determination of what sister organizations in mathematics and science are already doing and how the MAA might productively collaborate with or support such efforts; and (3) an identification of remaining unmet needs and whether or not other kinds of intervention programs might be appropriate to increase the underrepresentation of minorities in mathematics.

Four subcommittees on Collaboration, Creating Awareness, Local and Regional Action, and Recognition worked through 1987 to prepare reports for the larger Task Force. A recent $15,000 grant from The Ford Foundation will enable the Task Force to hold a final retreat to bring all its work together and prepare its final report to the MAA Board of Governors.

Louise Raphael, professor of mathematics at Howard University and presently on leave to the National Science Foundation, is the Task Force chair.

Minicourses

Approximately 600 mathematicians registered for the 14 continuing education minicourses held in conjunction with the 70th Annual Meeting of the MAA in San Antonio, Texas in January of 1987. In addition, over 250 mathematicians registered for the 7 minicourses offered during the 66th Summer Meeting in Salt Lake City, Utah in August of 1987. The courses increase in popularity each year and provide a variety of topics to the mathematical community.

Minicourses offered during 1987 included: A microcomputer linear algebra course using LIN-KIT, Howard Anton, Drexel University (offered at both the Annual and Summer Meetings); Introduction to computer graphics, Joan P. Wyzkoski, Fairfield University (offered at both the Annual and Summer Meetings); The teaching of applied mathematics, Gilbert Strang, Massachusetts Institute of Technology; Interesting applications of elementary mathematics, JoAnne S. Growney, Bloomsburg University; Discrete mathematics using difference equations, James T. Sandefur, Jr., Georgetown University; Using microcomputer software in teaching calculus, David A. Smith, Benedict College, and David P. Kraines, Duke University; Computer simulation of discrete systems, Zarian A. Karian, Denison University; Recurrence relations, Margaret Barry Cozzens, Northeastern University; Integrating history into undergraduate mathematics courses, Judith V. Grabiner, Pitzer College; Teaching mathematical modeling, Maurice D. Weir, Naval Postgraduate School, and Frank R. Giordano, U.S. Military Academy; True BASIC in freshman calculus, James F. Hurley, University of Connecticut; For all practical purposes, Solomon A. Garfunkel, COMAP, Inc. (offered at both the Annual and Summer Meetings); Applications of discrete mathematics, Fred S. Roberts, Rutgers University; Constructing placement examinations, John W. Kenelly, Clemson University; Applied mathematics via classroom experiments, Herbert R. Bailey, Rose-Hulman Institute of Technology; Using computer spreadsheet programs in calculus, differential equations, and combinatorics, Donald R. Snow, Brigham Young University; A survey of education software, David P. Kraines, Duke University; and A calculus lab course using MicroCalc, Harley Flanders, University of Michigan at Ann Arbor.

Publications 1987: Nine New Books and a Whole New Spectrum

The Committee on Publications and its subcommittees were very active in 1987. The MAA launched its Spectrum series with books by E. T. Bell and Paul R. Halmos. To recognize their direct editorial nature, the subcommittees for the various MAA series have been renamed Editorial Boards. Their members determine the editorial direction of these series and they ensure the high quality of our individual titles. This new designation recognizes their editorial contributions as analogous to those working on our journals.

The books published in 1987 are listed in the Executive Director's report and in FOCUS on Publications in the January-February 1988 issue of FOCUS. The President's report here also describes new initiatives in our publications program. For more about the authors who have contributed to our programs and the editors who have guided that program see the January-February 1988 issue of FOCUS.

Membership Continues to Climb

In 1987 the MAA individual memberships reached an all-time high of 26,269 as of December 31st. This includes 435 Life Members. Membership recruitment has been greatly enhanced during the last few years with the help of Marketing General, Inc. who, by the end of 1987, had supervised ten general membership and two non-member subscriber mailings.

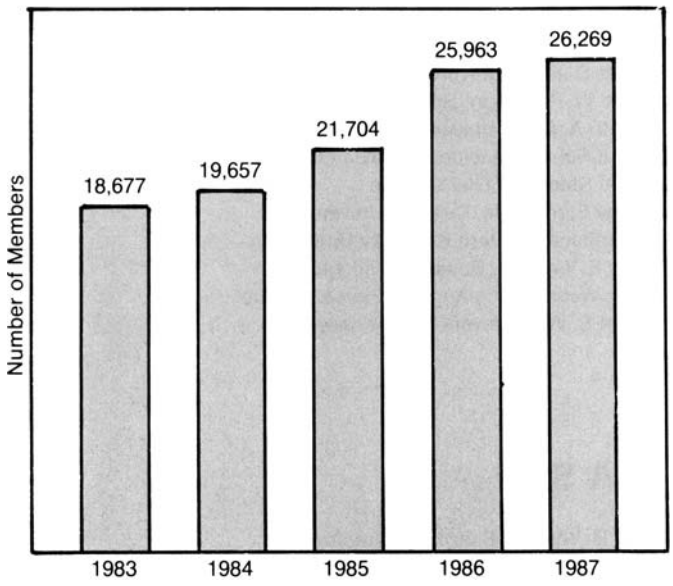
The demographic breakdown of individual memberships as of the end of 1987 was:

Students	3,761
High school teachers	2,790
College, university faculty	12,768
Industry, government	3,435
Retired or unemployed	1,960
Other	1,555
	26,269

In addition, there were 530 institutional members. These included high schools, junior and community colleges, four-year colleges and universities, and 15 special Corporate Members.

Agreements were approved with the Canadian Mathematical Society (CMS) that will encourage joint activities and membership. In particular, a member not residing in the U.S. will be eligible for a 15% discount on AMS and MAA dues provided he/she belongs to all three organizations. An MAA or AMS member who is not a resident of Canada will be eligible to be a member of CMS with a 15% discount on the dues rate.

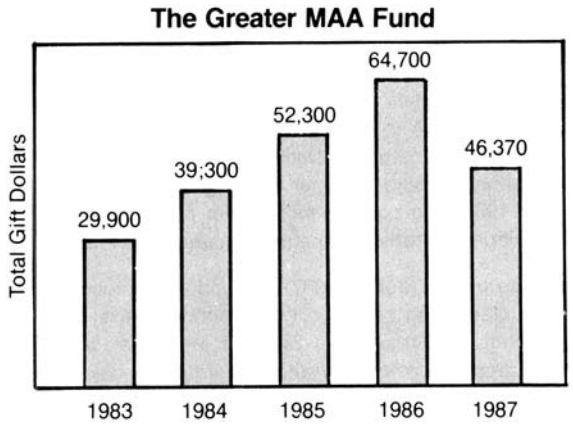
Year-end MAA Membership
1983–1987



In addition, the MAA adopted a policy of offering a free one-year membership to each person who receives a doctoral degree in mathematics.

MAA Board of Governors
January 1988

MAA Staff



The Greater MAA Fund
1987 Honor Roll of Donors

The Greater MAA Fund in 1987 was not able to sustain the momentum of growth which it exhibited during the last few years. Both the number of donors and its dollar amount decreased compared with 1986. Giving by members in 1987 totaled $46,370 from 1,378 donors. The loss of charitable deductions for non-itemizers as a result of the 1986 Tax Reform Act and the effects of the October 19 stock market crash were apparent in these losses. Funds donated to the R.H. Bing Memorial Fund amounted to $6,500 compared to $15,500 in 1986. It is hoped that this is a temporary setback.

Through the years the monies from the Greater MAA Fund have helped the MAA to (1) start up FOCUS; (2) renovate the carriage house behind the main property, which is now used as rental space; (3) carry out some of the work of Mathematics Awareness Week and the MAA commitment to a national Washington presence being funded by the Joint Policy Board on Mathematics; (4) assist certain committees to hold planning meetings; (5) establish the R.H. Bing Memorial Fund; and (6) provide some unrestricted funds for the Association to use where the need was greatest.

The officers of the Association express their gratitude to the membership for its support of the Greater MAA Fund. The names of all donors in 1987, except a few who wish to remain anonymous, are listed below.

GRAND BENEFACTOR Malcolm K. Brachman, Everett Pitcher, Anonymous, (1).

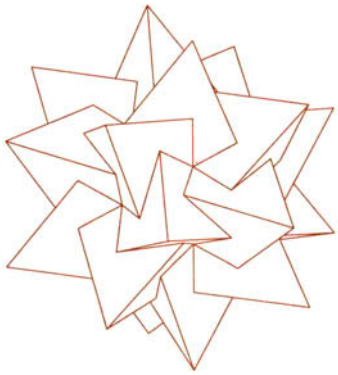
BENEFACTOR Mr. and Mrs. Alfred Aeppli, Mr. and Mrs. Raymond Barnett, Mr. and Mrs. Herbert Baruch, Leonard Gillman, Anna S. Henriques, Mr. and Mrs. Ralph Mansfield, Department of Mathematics, University of Texas.

GRAND PATRON Howard Anton.

PATRON Gerald L. Alexanderson, Stewart Boden, Mr. and Mrs. T. Hoy Booker, John Bramsen, Paul J. Campbell, Ronald Davis, Roy Dubisch, Peter L. Duren, Richard L. Gantos, Richard P. Goblirsch, Arthur Grad, Joseph D.E. Konhauser, Donald L. Kreider, Albert E. Meder, Jr., D.D. Miller, Chester W. Mills, Mr. and Mrs. David Penney, Franklin Richards, John M. Smith, Lynn Steen, Dalton Tarwater, Albert W. Tucker, Allyn J. Washington, William and Ann Watkins, John E. Wetzel, Mr. and Mrs. Stephen Willoughby, Kenneth Wooster, Anonymous, (1).

SPONSOR Elliott T. Adams, Jeanne Agnew, Henry L. Alder, N. Hansen Ball, Albert Barksdale, Frank Barnet, E. Maurice Beesley, Lowell W. Beineke, Robert D. Bergstein, Ralph P. Boas, William E. Boyce, James C. Cantrell, Richard M. Cohn, Mr. and Mrs. James Cornette, Alice Dickinson, William E. Dorion, William L. Duren, Jr., Charles H. Frick,

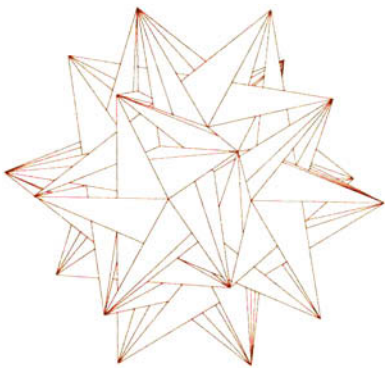
John R. Gilbert, Jr., Andrew M. Gleason, J.H. Graham, Mary-Elizabeth Hamstrom, Elizabeth H. Harmon, W.R. Harris, Bill Hassinger, Jr., Neil J. Haynes, Mr. and Mrs. Don Hill, Betty F. Hinman, Richard A. Hord, David L. Johnson, Wilfred Kaplan, Kenneth K. Kloss, Ralph M. Krause, Henry A. Krieger, Margaret L. Lial, May H. Maria, Robert G. Maule, John R. Mayor, Mr. and Mrs. Archie McKellar, Paul D. McNiff, James W. Mellender, Bruce E. Meserve, Richard S. Millman, Mary Muskoff Neff, John D. Neff, Morris Newman, Mr. and Mrs. Eugene Nichols, Eric C. Nummela, Robert Piziak, Gerald J. Porter, Mr. and Mrs. G. Baley Price, Mr. and Mrs. Gordon Prichett, Kenneth R. Rebman, Mina Rees, Charles E. Rickart, Donald J. Riley, Andrew A. Rivera, Mr. and Mrs. Frank Rizzardi, Kenneth Ross, Issac J. Schoenberg, Raymond Shawstad, Grace Shover Quinn, Stephen J. Spindler, Marjorie L. Stein, Maria W. Steinberg, Andrew Sterrett, Michael T. Surdyk, George B. Thomas, Jr., Elmer Tolsted, Uri Treisman, Alan C. Tucker, Jerry Van Vleck, Robert Weinstock, Lucille E. Whyburn, Paul T. Witzke, James A. Yorke, Anonymous, (3).



CONTRIBUTOR Yousef Alavi, George E. Alberts, Billy D. Arendt, Sheldon Axler, George A. Baker, William R. Ballard, Arienne S. Balser, Leon Bankoff, L.A. Becerra, Simon J. Bernau, Andrew C. Berry, Charles H. Bertness, Peter B. Bjorklund, Robert Black, Blair Sterba-Boatwright, William M. Boyce, Mr. and Mrs. George Brauer, Robert E. Brown, Richard G. Brown, Francis R. Buianouckas, Richard T. Bumby, Donald W. Bushaw, Marjorie V. Butcher, Roderick P. Caldwell, Mr. and Mrs. B.F. Caviness, Pedro J. Charria, Seok-Hyeon Cheon, Bruce I. Cohen, John M. Coker, Thomas A. Cootz, George E. Crane, James P. Crawford, A.B. Cunningham, Richard J. Daily, M. Hillary Davies-Wick, Carlos S.S. De Oliveria, Anthony B. Diluna, William E. Dowling, Robert L. Druet, Robert D. Edwards, William I. Eggers, Charles Everett Dutton, Ian Ferris, Gerald B. Folland, J. Sutherland Frame, Murray Gechtman, Robert Gilmer, Michael J. Gilpin, Ben T. Goldbeck, Richard Goldberg, Vera R. Granlund, Jack E. Graver, Samuel W. Hahn, Rohan Hemasinha, Stephen R. Hilbert, Peter Hilton, John M. Horvath, M. Gweneth Humphreys, James Huneycutt, Gerald J. Janusz, Roy A. Johnson, H. Price Kagey, Mr. and Mrs. Zaven Karian, John Kenelly, Daniel Kennedy, Allan M. Kirch, Edwin M. Klein, Ernest J. Klotz, Sue L. Korsak, Helen Kriegsman, Richard Laatsch, Jackson B. Lackey, Bernard W. Levinger, Charles J. Lombardo, Bernard L. Madison, Eugene A. Margerum, Thomas J. Marlowe, Andrew Matchett, Stephen B. Maurer, Mr. and Mrs. Ichiro Murase, Weston Nathanson, Edward C. Nichols, Robert Osserman, Carol B. Ottinger, Harold Oxsen, Francis D. Parker, James V. Patton, Allen H. Petersen, John W. Petro, Tom Price, Sara L. Ripy, Raphael M. Robinson, Edwin A. Rosenberg, Saturnino Salas, Donald Sanderson, Norma Pauline Schmid, Richard M. Schori, Erik Schreiner, John Schue, John A. Schumaker, S. David Shapiro, Bernard H. Shapiro, Charles Shenitz, Albert P. Shulte, Thomas H. Slook, Don Small, Louis Solomon, Kevin Stinson, A.H. Stone, Richard D. Stratton, Marcia P. Sward, John A. Thorpe, Shirley R. Trembley, Wolmer V. Vasconcelos, Gregory Wene, Don West, Donald W. Western, Bob Williams, Stephen J. Willson, Melvin R. Woodard, Marilyn J. Zweng, Anonymous (14).

SUSTAINER Vaughan A. Aandahl, Dewey F. Abell, Lee R. Abramson, Sheldon B. Akers, Joe F. Allison, Dean L. Alvis, Mr. and Mrs. Donald Anderson, Stuart Antman, Kenneth I. Appel, Ronald L. Arms, Robert J. Arnold, James J. Artherton, Florence H. Ashby, Charles E. Aull, George Bachman, Bridget B. Baird, Frederick A. Bakenhus, John W. Bales, Ruth A. Bari, Walter W. Bartlett, Donald Batman, Andrew Battisti, Lynne A. Baur, Kathleen J. Bavelas, Kathleen Baxter, Barbara J. Beeckler, Margretha M. Bentz, Francisco Bernis, G.G. Bilodeau, Bruce H. Blair, Gertrude Blanch, Gene E. Bloch, John D. Bradburn, Murray Braden, Clarence H. Bradford, Robert H. Bradway, Walter Brady, Allen H. Brady, Fred G. Brauer, Nancy J. Bray, George H. Bridgman, Gary L. Britton, Scott Brodie, Donald M. Brown, Terrell N. Brown, Heinz A. Bruggesser, Michael Brusin, Mr. and Mrs. Billy Bryant, Milo F. Bryn, John C. Burkill, James J. Byrnes, Herman Cadavid, Edward A. Cameron, Raymond J. Cannon, Jr., James H. Carruth, John E. Carson, Herbert Carus, Glen M. Castore, Vasily C. Cateforis, Shao-Chien C. Chang, Charles A. Chapman, Theodore S. Chihara, Chris Christensen, Richard C. Churchill, Philip S. Clarke, Lester M. Clendenning, Jane E. Clifford, Daniel I.A. Cohen, A.J. Coleman, Edwin H. Comfort, Arnold A. Coolsaet, James J. Corbet, Clyde L. Corcoran, Clifton E. Corzatt, Samuel G. Councilman, T.H.M. Crampton, Helen F. Cullen, George S. Cunningham, Douglas W. Curtis, Karl David, Lloyd Davis, Edmund I. Deaton, Charles R. Deeter, Shirley T. Deeter, Patricia Defelica, Ronald E. Domen, J.L. Dorroh, Mr. and Mrs. Walter Doss, Gregory M. Dotseth, Sandra L. Draham, John R. Durbin, James M. Eastham, Earl F. Ecklund, Jr., Constance L. Elko, George W. Ellis, Jessie A. Engle, Robert C. Eslinger, Edward T. Esty, Sue S. Farmer, Arnold L. Fass, Frank D. Faulkner, Sandra Fillebrown, Abraham B. Finklestein, Ruth A. Fish, Patrick J. Fitzsimmons, Harley Flanders, Charles R. Fleenor, Peter R. Flusser, Stephen H. Forbes, Joseph B. Frechen, Herta T. Freitag, Jiro Fukuta, B.A. Fusaro, Richard F. Gabriel, A.S. Galbraith, Kenneth R. Gittleson, Zeather N. Gladney, Michael Glass, Robert A. Glover, Samuel Goldberg, Leonard D. Goldstone, Mr. and Mrs. Michael Golomb, Ronald A. Gove, James C. Graham, Adonis L. Gray, John W. Green, Eleanor Green D. Jones, Gary W. Grefsrud, James Grochocinski, Benjamin F. Gundelfinger, James E. Hall, Marshall Hall, Jr., Frank Harary, William J. Hardell, Beverly B. Hargraves, James D. Harper, Henry T. Harris, Jr., Mr. and Mrs. Orville Harrold, John G. Harvey, Judith P. Hawthorne, John C. Hayes, David F. Hayes, Nola A. Haynes, Michael P. Healey, Ruth E. Heinz, Joseph Hemmeter, Francis M. Henderson, Leon A. Henkin, Thomas A. Hern, Delfin G. Hernandez, James B. Herreshoff, Emil R. Herzog, Gerald A. Heuer, James F. Heyda, Franz X. Hiergeist, Helen Louise Hoffman, James L. Howell, John P. Hoyt, James G. Huard, Joseph A. Hughes, Carl C. Hughes, Walker E. Hunt, James F. Hurley, Lee P. Hutchison, William G. Hutchison, Jr., Bruce Ingraham, Joan Innes, Yoe Itokawa, Gerald L. Itzkowitz, Stanley Jackson, David Jacobson, Gerald G. Jahn, Thurman M. Jasper, Larry A. Johnson, Russell E. Jones, David P. Jones, Robert Kalin, Ata Kasem, Eleanor Kay-Mirich, John B. Kelly, Patricia C. Kenschaft, Irving J. Kessler, Steven C. Kienle, B.M. Kiernan, Clark H. Kimberling, Alice M. King, Larry M. King, William A. Kirby, Donna L. Kirch, Robert C. Knapp, Donald E. Knuth, Peter M. Kohn, David M. Krabill, Eunice L. Krinsky, Susan R. Kropiewnicki, Gary R. Krumpholz, David E. Kullman, Edward M. Landesman, John E. Lange, Bernadine C. Lanzano, Walter R. Lawson, Anneli Lax, Shirley A. Lee, John S. Lew, Bingxi Li, Rudolf B. Lim, M. Albert Linton, Kay P. Litchfield, Richard A. Little, John T. Loftus, Clifford A. Long, Peter Longo, John F. Lucas, Clement Lutterodt, John MacDonnell, Thomas A. Mackey, Alan W. Magnuson, J.J. Malone, John L. Manferdelli, Margaret O. Marchand, Caryl Margulies, Wanda A. Marosz, Ella M. Martin, Ronald M. Mathsen, David Matlack, Arthur P. Mattuck, Christopher Mawata, Robert D. May, Raymond A. Mayer, Jr., Michael J. McGraw, Joyce R. McLaughlin, Ray A. McClanahan, Otis B. McCowan, Sandy L. McKaig, Morris Meisner, Sandra Ann Mertes, Tatiana Mihnea, Philip E. Miles, Jack M. Miller, Mr. and Mrs. Michael Miniere, Gerald A. Mischke, Mabel D. Montgomery, Leone C. Monticone, James D. Moore, Richard A. Moore, Lester T. Moston,

Chris L. Mueller, Elsie C. Muller, Peter J. Mumford, Grattan P. Murphy, Kenji Nagasaka, Norman W. Naugle, John D. Nelligan, Raymond S. Nichols, Francis A. Norman, William O. Nowell, Jr., M. Lesley O'Connor, Anne F. O'Neill, Edwin N. Oberg, Rene E. Olivares, Sandra E. Oliveri, B.C. Oltikar, Paul Olum, Hironori Onishi, Peter J. Osoky, John K. Ostlund, Clem Z. Ota, David B. Oulton, T.J. Overley, Karen L. Owens, Calvin I. Owens, S. Panchapakesan, Mary Parker, Herbert A. Pekins, William H. Pell, Charles D. Pennington, John M. Perry, Thomas F. Peter, Juanita J. Peterson, Dix H. Pettey, Dean Phelps, Robert R. Phelps, Joseph G. Pigion, James M. Pike, George Piranian, Donald L. Plank, John D. Pletta, Peter R. Pomeroy, Cynthia J. Priest, Murray H. Protter, Calvin Pullias, John F. Randolph, Ronald J. Rauhauser, Maxwell O. Reade, John W. Rebman, Robert W. Rector, Richard S. Rempel, Jane Repko, Neil W. Rickert, V.F. Rickey, Chris D. Ringo, John A. Roberts, Todd D. Rockhold, Robert A. Rosenbaum, George M. Rosenstein, Mr. and Mrs. Haskell Rosenthal, Paul Ross, Emilio O. Roxin, Isabelle P. Rucker, T. Benny Rushing, Patrick E. Ryan, Michael G. Rybacki, David Sachs, Marc D. Sanders, Donald E. Sarason, David Saunders, Richard C. Scalzo, John F. Schaak, Richard L. Schauer, Ernest C. Schlesinger, Ralph O. Schmidt, Harvey J. Schmidt, Charles M. Schneeberger, Dennis B. Schneider, David I. Schneider, K.C. Schraut, Augusta L. Schurrer, Shepherd Scott, Charles H. Sedgewick, Rose Sedgewick, Stephen A. Sedory, Bernard B. Sevart, Abdul Alim Shabazz, Henry Sharp, Jr., John M. Shaw, Abe Shenitzer, Mr. and Mrs. Frank Sherburne, Mr. and Mrs. Arnold Shilepsky, Theodore J. Shively, Mr. and Mrs. Warren Shreve, T. Sidewater, Martha J. Siegel, Sandra A. Skiba, David Sklar, John S. Skocik, Basil Skordinski, Stephanie Sloyan, James L. Smith, Wilbur L. Smith, Charles R. Smith, Rubin Smulin, Wallace Soderquist, Michael J. Sormani, Francis Spencer, Jr., Stephen E. Spielberg, John W. Sprout, Robert S. Stacy, Orestes N. Stavroudis, William F. Steele, Anne K. Steiner, Robert B. Stern, Richard S. Stevens, Daniel L. Stock, Elmer L. Stone, Walter B. Stovall, Robert A. Sulanke, Ida A. Sussman, Ann M. Sutcliffe, Michael D. Sutton, Steven Taniguchi, Angus E. Taylor, Theodor Teichmann, David G. Terpenning, James W. Thomas, Marc P. Thomas, Samuel R. Thompson, III, James C. Thorpe, Wolfgang J. Thron, Charles R. Traina, Michael F. Tuchman, Bryant Tuckerman, Jaroslav Tuzar, Visutdhi Upatisringa, Dirck Uptegrove, John P. Van Alstyne, H.R. Van Der Vaart, Donald W. Vanderjagt,



Dale E. Varberg, Paul A. Vodola, Paul S. Voight, Florian M. Walchak, William J. Walden, Sylvan Wallach, John T. Walsh, Joe F. Wampler, Buck Ware, Bette L. Warren, Stefan E. Warschawski, John Weaver, John V. Wehausen, Peter J. Weinberger, Maurice D. Weir, Barbara A. Welsh, Geraldine West, James C. White, Robert C. Whitton, Howard H. Wicke, Robert S. Williams, George K. Williams, David L. Wilson, N. Convers Wyeth, Lawrence J. Zimmerman, Leon P. Zukowski, Anonymous, (27).

OTHER DONORS Joseph Abate, Ian M. Aberbach, Clarence M. Ablow, Stephen H. Adachi, William W. Adams, Cathy Adams, Lateef A. Adelani, Indrasena Adluri, Mary L. Adolphsen, Andrew N. Aheart, Mohammad Ahsanullah, Neil E. Aiken, Kazuo Akiyama, M.K. Ali, Jeffrey C. Allen, William O. Alltop, Charles A. Amundsen, Carl W. Anderson, Bertil Anderson, Edward Anderson, Edward A. Anderson, Jr., George Angwin, David L. Armacost, Kay S. Arms, Timothy K. Arnold, Anthony M. Asci, Winifred A. Asprey, Clayton H. Atkins, John A. Ausink, Bernice Auslander, Kathleen Ayers, Christine W. Ayoub, Gregory F. Bachelis, Nada B. Bachour, Paul U. Backer, K.H. Bailey, Jr., Paul M. Bailyn, George Baloglou, Uptal Banerjee, Paul J. Bankston, William H. Barker, Robert F. Barnes, Lida K. Barrett, Jonathan C. Barron, Alfredo M. Barron, Michael Beals, Steve Beccue, Alfred S. Beebe, Gerald G. Beimler, Michael E. Bennett, Carlos M. Bentancourt, Deborah J. Bergstrand, Gerald E. Bergum, Salvatore D. Bernardi, Michel Bernay, Dorothy L. Bernstein, Satish C. Bhatnagar, Charles M. Biles, Daniel C. Biles, Aida C. Bird, Clair J. Blackwell, Robert L. Blair, William D. Blair, Ernest E. Blanche, William T. Bland, Michael M. Blatnick, Lenore C. Blum, Dale P. Boden, William M. Boothby, William W. Bosch, Julia W. Bower, Thomas P. Bower, Linda H. Boyd, Sylvia T. Bozeman, John D. Brading, Steve Branch, Larry J. Brant, Susan S. Brinckerhoff, Barbara J. Britton, Odile S. Brock, James O. Brooks, Clayton T. Brooks, John E. Brothers, Arthur B. Brown, Donald Brown, Vincent J. Bruno, Suzanne C. Bryan, Billy F. Bryant, Lyle F. Buchwitz, Robert J. Buehler, Robert P. Bukowski, Debra L. Burton, David M. Busey, Walter Businger, John H. Butchart, Paul F. Byrd, Kenneth A. Byrd, George Cain, Donna A. Calhoun, Bruce C. Call, Larry A. Cammack, John J. Campbell, James E. Campbell, Christine R. Cancro, Bernard G. Carlisle, Keith A. Carlson, Richard D. Carmichael, Dennis J. Caro, Nathaniel Chafee, Satyabrata Chakrabarti, Jack-Kang Chan, Onn Chan, I-Chew Chang, Barton T. Chartoff, Carolyn A. Chekaway, Patrick Chiu, Kwang S. Choi, Charles C. Chouteau, Yi C. Chow, Tseng Y. Chow,Wing Keung Chu, Thomas P. Cieslik, Fritz L. Clermont, Robert Cliche, Alfred H. Clifford, James A. Cochran, Martin J. Cohen, Regina B. Cohen, Lois A. Contino, Christopher W. Copple, Henri Cornet, Lawrence W. Cosenza, Jr., Jere Courtney, Michael D. Covney, Milton D. Cox, Wayne H. Cramer, Cecil E. Crawford, Marilyn B. Cross, Edwin L. Crow, Catherine Cummins-Hays, John D. Curry, Philip C. Curtis, Robert D. Cushnie, W.F. Cutlip, John A. Dapper, Boris A. Datskovsky, Guiliana P. Davidoff, Lawrence D. Davly, Dominique P. DeCaen, Barbara Deason, Donald W. Degray, Franklin D. Demana, David J. Deutsch, Mr. and Mrs. Robert Dickinson, Gerald P. Dinneen, Laurence D. Domino, Lillian J. Donohoe, Brian F. Doolin, Robert S. Doran, Robert W. Dowdle, Mary M. Dowlen, Thomas A. Dowling, Reuben C. Drake, Peter A. Duclos, James J. Dudziak, Gloria E. Duncan, Mr. and Mrs. Edgar Eaves, Louise H. Echols, James J. Eckerman, William R. Edwards, Steven J. Edwards, Herbert Elliott, Jr., C. Harry V. Ellis, Wade Ellis, Jr., Raymond L. Ely, Wellington C. Engel, James W. England, In B. Eom, Nathan H. Epstein, Dickran H. Erkiletian, Marion Escobar, Leroy Estergard, Ruth M. Fansler, Fereidoun Farassat, Albert B. Farnell, Theodore S. Feit, Manuel Feliciano, Jr., Shari L. Feliksiak, Samuel R. Filippone, Kathe E. Fink, Elizabeth H. Fishburn, Richard J. Fleming, Denis R. Floyd, Peter C. Foltz, Andrew Foster, Douglas H. Frank, Mr. and Mrs. Frank Frankovich, Michael C. Freda, C.L. Frederiksen, John L. Freeman, E. Clare Friedman, James O. Friel, Kenneth J. Friesen, Thomas J. Fritsch, Mary E. Froustet, Leonard E. Fuller, Lisl N. Gaal, Margo Galson, J. David Garn, Ronald F. Garrett, Betty B. Garrison, Smuel Y. Gebre-Egziabher, Gerald S. Gelatt, Richard Geller, Julian Gevirtz, Claudia M. Giamati, John B. Giever, Michael D. Gilbert, Paul G. Glenn, Germana I. Glier, John A. Goebel, David M. Goecke, Richard R. Goldberg, Jerry Goldman, Samuel M. Good, Robert N. Goss, Frederico Grabiel, Juni Granger, William J. Gratzer, Peteris E. Graube, Linda K. Griffith, Elliot M. Grumet, Shobha Gulati, Frances F. Gulick, Diane H. Haber, Peter J. Hagis, James N. Hagler, Byung G. Hahn, Thomas E. Hale, David Hall, Kathy S. Halvorson, Ray O. Hamel, Josephine S. Hamer, Carl Hammer, Michael E. Hammond, William F. Hammond, J.F. Hancock, Charles E. Hansborough, John M. Hansen, Robert H. Haring-Smith, Charles D. Harris, Glen F. Hart, Ruth A. Hartman, Jerry M. Hawn, Frank S. Hawthorne, Eric Hayashi, Douglas J. Hazlett, David A. Hecker, Sondra L. Heidt, Carl E. Heilman, Ronald E. Helmick, Lance E. Hemlow, James P. Henderson, Richard E. Hendriks, Elmer L. Hensley, Margaret A. Hermann,

In May of 1987, James Halloran, president, Mary P. Dolciani-Halloran Foundation , and Leonard Gillman, MAA president, placed this plaque commemorating the contributions of Mary Dolciani Halloran to mathematics and education. Her career ranged from Cornell, to Oxford, to the Institute for Advanced Study, to Vassar College, and back to Hunter College, her alma mater. She was a mathematician, a teacher, and an author. Her generous support helped the MAA purchase its headquarters, the Dolciani Mathematics Center, where this plaque hangs.

Magnus R. Hestenes, Troy L. Hicks, Charles F. Hicks, Douglas H. Hilpipre, Daniel W. Hinz, Hisayo Hirahara, Arthur M. Hobbs, Robert D. Hofer, Louis D. Homer, Douglas V. Horacek, Jean Horn, Rosalind R. Horowitz, Linda H. Host, Joseph A. Hratz, Verena Huber-Dyson, Carlos Huerta, Victor H. Hughes, III, Won Huh, Douglas S. Hulbert, Wallace Hummasti, James F. Hurley, Terry L. Hutson, Nancy J. Ingram, Godfrey L. Isaacs, Eugene Isaacson, Dean J. Ives, Carrie B. Jackson, William Jackson, William C. Jackson, Douglas F. James, Sarah K. Janes, R.D. Jarvinen, Thomas J. Jensen, Mr. and Mrs. Carl Jockusch, Wayne R. Johns, Sandra G. Johnson, Diane M. Johnson, Robert C. Johnson, Charles N. Johnson, Paul B. Johnson, Eleanor G. Jones, Robert M. Jones, Dallas J. Jones, Kathleen B. Jones, Jay A. Jorgenson, Walter A. Kaletka, Alfred Kalfus, Paul T. Karch, Kon Katselas, Michael C. Keily, Fritz Keinert, Ann W. Kellner, Alice J. Kelly, Edward S. Kennedy, William H. Kent, Michael J. Kent, John C. Kernast, Eric S. Key, Fareed A. Khan, Peter C. Kiessler, Diana Kieu, Donald R. King, L.R. King, Susan L. Kinner, Benjamin G. Klein, Alexander F. Kleiner, Jr., Virginia H. Klenk, Randall G. Knapp, Tsz Mei Ko, Robert J. Kolesar, Robert J. Komas, Horace Komm, Paul J. Kozsuch, Robert J. Kramer, Stephen Krevisky, Alan C. Krinik, Valery Krupkin, Norbert J. Kuenzi, Sidney H.L. Kung, Herbert Kurss, John F. Kurtzke, Jr., Dorothy H. Labarbera, Donna M. LaFlamme, Nancy L. Laing, William M. Laird, John F. Lamb, Jr., Patricia R. Lane, Mary P. Langley, Perry E. Lanier, Arnold Lapidus, Martha A. Larkin, Lind G. Lauger, Felix Lazzebnik, Arnold Lebow, Steve Lee, Ruth S. Lefkowitz, Lew Lefton, Robert N. Leggett, Joseph Lehner, Max Leleiko, Philip A. Leonard, Norman Levenberg, Richard G. Levin, Jack Levine, Douglas Lewan, Charles J. Lewis, William A. Lewis, Robin A. Lewis, Elliott H. Lieb, C. David W. Lind, Joseph P. Lindor, Andrew C-F Liu, Norman Locksley, Anne K. Loesch, Joseph C. Loo, Ann C. Luciano, Elizabeth C. Lukacs, Robert B. Lumbert, Virginia G. Lunde, Gerold Luss, Chester F. Luther, Adrain P. Luthy, Chicha P. Lynch, Kevin Ma, Rosemary MacCagnan, Maurice Machover, Margaret H. MacMillian, Kay Magaard, Joseph S. Mamelak, Jerome Martin, Presciliano Martinez, Edward V. Masha, Anthony R. Matlak, Thomas H. Matthews, Mary Maxwell, John S. Maybee, Daniel I. Maysonet, Jeanne E. McKinnon, Charles E. McLean, Diane T. McNichols, Elna B. McBride, Donald McCarthy, Mary K. McCarty, William S. McCulley, Joseph M. McDonough, Richard E. McGill, John P. McLaughlin, Kelly D. McLenithan, Roy H. McLeod, Robert F. McNaughton, Jr., D.G. McRae, Jack R. Meagher, Mike Mears, Geoffrey L. Meissner, Michael J-H Meister, Richard Mercer, Joseph F. Miazga, Jr., Darlene Midori Hayashi, John G. Milcetich, William D. Miller, Tilla K. Milnor, C. David Minda, Walter J. Miochaelis, Paolo Montuschi, Rufus Moore, Robert C. Moore, Cathleen S. Morawetz, Robert M. Morelli, Bruce E. Morris, Peter C. Morris, Harry L. Morrison, Lawrence N. Morscher, Albert F. Morse, Joseph G. Moser, Joseph M. Moser, Paul S. Muhly, Earle F. Myers, Dale W. Myers, William H. Myers, D.D. Nadkarni, David P. Nasby, M.Z. Nashed, Maria M. Navarrete, James A. Nickel, Robert A. Nielsen, Jack Nolde, Edward A. Nordhaus, Donald O. Norris, W.P. Novinger, Bernard H. Nuemann, James D. Nulton, Julie O'Connell, John C. O'Neill, Shane O'Neill, Thomas J. O'Reilly, Alfredo Octavio, Jean K.Y. Okumura, Alan R. Osborne, Henry J. Osner, Hector D. Pacheo, Joseph W. Paciorek, Helen L. Paisner, Elwood G. Parker, Eli Passow, Malcolm R. Patterson, Paul Payette, George W. Peglar, William H. Peirce, Joseph Pekarsky, Thomas J. Peneski, Lorraine R. Penn, Paul M. Perdew, Paul F. Peters, Kostas Petrakos, Gaston E. Phillips, Robert L. Plunkett, George G. Polak, Douglas D. Punke, Harold L. Putt, Loi Trong Quan, Jorge Quiroz, Betty E. Ramirez, Adelbert W. Ransom, John C. Rayko, Rosemary Reichhold, Mr. and Mrs. James Reiland, Irma M. Reiner, Mr. and Mrs. Robert Reisel, George W. Reitwiesner, Bruce A. Reznick, David L. Rice, Robert M. Richardson, Gisele R. Rieder, Mignon S. Riley, Fred J. Rispoli, Archie R. Ritter, Lois J. Roberts, Edward M. Robinson, Steven E. Rochefort, Mauro E. Rodriguez, Michael K. Rood, Charlotte G. Root, N.J. Rose, Ned I. Rosen, Alex Rosenberg, Thomas G. Rosholt, Shepley L. Ross, II, Ben D. Roth, Toben I. Rower, Robert J. Rubin, John Russo, Dorothy S. Rutledge, Donald E. Ryan, Michael D. Ryan, Clarence F. Rydeen, Charles J. Rykken, John F. Sallee, Sue W. Sams, Mayra Alonso San Roman, Rafael Sanchez-Diaz, Maurice A. Scheier, OFM, Veronica L. Schreiber, Blanche B. Schultz, Scott Schumacher, Stephen C. Schumacher, Eugene F. Schuster, Michael J. Scudder, Karl H. Seer, Michael J. Segal, John J. Segedy, Arthur G. Settle, Gary P. Shannon, Jack V. Shaw, Franklin, F. Sheenan, Maynaid W. Shelly, Rebecca M. Shelton, Dorothy A.M. Shirley, Jack Silber, Evelyn M. Silvia, Robert Simonsen, Phyllis E. Singer, Kanhaya L. Singh, David B. Singmaster, Martin D. Skane, Tim W. Smith, Samuel E. Smith, David A. Smith, Ian N. Sneddon, Robert Solin, Lawrence E. Somer, William L. Soule, Jr., Donald J. Sparks, Otis S. Spears, Jo Ingle Stan Ediger, Mr. and Mrs. Thomas P. Starbird, Michael P. Starbird, Brett A. Starnes, Stephen D. Stearns, Alfred T. Steele, Henry Stern, Robert Stewart, Harold J. Stolberg, Kenneth E. Storm, Clarence B. Stortz, Tina H. Straley, R.E. Street, Colin Strickland, Ellsworth E. Strock, Jefferey Stuart, Hugo S. Sun, Woodrow Sun, Bill E. Swafford, Maura T. Sweeney, Peter P. Szabaga, Marcia D. Taggart, Fiory A. Tallini, Janeatte H. Tanaka, Terry Tarbox, Edward C. Thoele, Sara G. Thompson, Gerald L. Thompson, Harold Thornton, Peter M. Todd, Kathryn B. Toll, Luz G. Torres, Alan W. Toth, Rebecca D. Troxler, George Tsapakidis, Paul Y. Tseng, Jonathan M. Turner, William D. Ullery, Marilyn H. Van Keppel, Nick H. Vaughan, Ronald L. Vavrinek, Johannes Vermeer, Peter U. Vinella, William E. Vonwicklen, Daniel H. Wagner, Clifford H. Wagner, Patiick J. Wainwright, Robert C. Wall, Nancy J. Warden, Thomas S. Warner, Carl A. Waters, Herbert H. Watham, Stanley G. Wayment, Stephen T. Weinstein, Elizabeth Weinstock, Eric K. Wepsic, Betty B. Werner, Marion D. Wetzel, Robert L. Wheeler, Alvin M. White, Charles S. White, Gladys G. Whitehead, George W. Whitehead, Richard H. Whitehill, Ralph M. Whitmore, Sylvia Wiegand, John V. Wiggins, J. Ernest Wilkins, Stanley C. Williams, Margaret S. Willis, Herberg Wills, III, Patricia S. Wilson, Catherine M. Winter, Izaak Wirszup, James J. Woeppel, William R. Wolfers, Bing K. Wong, H. Ship-Fah Wong, John W. Wrench, Jr., J. Wendell Wyatt L., Kenya Yamoaka, Jose L. Yanez, Marian Y. Yong, Genji Yoshino, Lawrence Young, Paul M. Young, William L. Young, David S. Yuen, Neal Zierler, Frances E. Zimmer, Ben F. Zirkle, Max A. Zorn, Paul Zorn, Miriam T. Zurn, Anonymous, (31).

Stellations of the icosahedron on pages ix–x.
© Walter Taylor, University of Colorado, used by permission.
Execution based on joint work with Brent Browning.

1987 Financial Reports

Donald L. Kreider
Treasurer

In 1987 the MAA experienced a deficit of approximately $51,000 on its total budget of just over three million dollars. This was lower than had been predicted earlier, largely because of deficit reduction procedures introduced by the Finance Committee in the middle of the year.

During the past several years the MAA has, under the leadership of active presidents, increased its programs significantly. Membership has grown 50% through aggressive recruitment. Our publication program has new leadership that is seeking to broaden our book series. Our editorial headquarters has been moved from Buffalo to Washington. New projects have been launched in response to national concern about the quality of mathematics education and to the availability of funds to support them. And our Washington presence has become more active, in cooperation with AMS and SIAM, to help guide national efforts to improve mathematics and science education. One result of these new directions is that we now have many activities without long histories. This makes it more difficult to budget accurately; however we have made progress.

Among the larger decisions facing the MAA in the near future will be the way we handle the additional investment that we need to make in our headquarters building. Our building at 1529 18th Street has served us well for the past ten years but now needs significant renovation to preserve its value both as a headquarters building and as a source of rental income. Its value has appreciated from approximately $800,000 to a recent appraisal of $4,200,000. During the same period taxes on the property have risen by a factor of ten, and the need for substantial renovation, estimated to be at least $1,500,000, has become more and more pressing. These can be classified in some sense as "good trouble." In retrospect, the acquiring of the building showed incredible foresight and we can take comfort from the value of the property today. Nevertheless, trouble they are. We will need to make some fundamental decisions very soon—do we renovate and remain in our present location?—do we move to a new location in the Washington area?—do we follow the flight of many other associations to the immediate suburbs? Our decisions in this matter will be as important for MAA's future leadership within the mathematics community as was our decision to purchase the building in Washington ten years ago.

The MAA remains in a strong financial position and is able to respond to these challenges. The next several years are important as we work more closely with the several mathematical associations to widen general understanding of mathematics and to improve mathematics education in America.

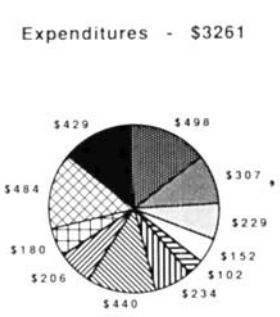
CONSOLIDATED MAA BALANCE SHEET
December 31, 1987

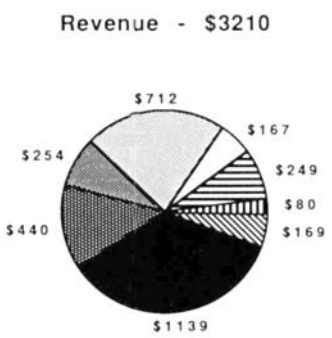
ASSETS

Current Assets	
Cash	$285,857
Liquid Assets	$236,330
Accounts Receivable	$387,052
Publications Inventory	$176,150
Prepaid Expenses	$122,545
Total Current Assets	$1,207,934
Non-Current Assets	
Investments (at cost)	$676,322
Furniture and Equipment	$376,892
Building (at cost)	$816,456
Building Improvements (at cost)	$135,473
Accumulated Depreciation	($402,624)
Deferred Development Costs	$62,690
Total Non-Current Assets	$1,665,209
TOTAL ASSETS	$2,873,143

LIABILITIES AND FUND BALANCES

Current Liabilities	
Accounts Payable	$173,363
Notes Payable	---
Accrued Royalties	$26,204
Other Accrued Liabilities	$138,337
Prepaid Dues and Subscriptions	$1,363,220
Total Current Liabilities	$1,701,124
Long-Term Liabilities	
Mortgage Payable	$297,860
Unexpended Grant Receipts	$78,326
Total Long-Term Liabilities	$376,186
Total Liabilities	$2,077,310
Fund Balances	
Unrestricted Fund Balances	$362,806
Restricted Fund Balances	$299,907
Endowment	$133,120
Total Fund Balances	$795,833
TOTAL LIABILITIES & FUND BALANCES	$2,873,143





FOCUS EMPLOYMENT ADVERTISEMENTS

Rates for FOCUS Employment Ads are:

- 50 words or less: $37.50
- More than 50 words: $45.00 per column inch

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

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

The deadline for submission in the September issue is July 29.

Computer Science, Math, Physics:

Faculty position in Physics and/or Mathematics. Tenure track position beginning August 15, 1988. Teach 24 semester hours per academic year. Participation in departmental and college activities, commitment to undergraduate teaching, and leadership in continued curriculum development expected. Doctorate in either physics or mathematics preferred, ABD or Master's Degree may apply. Physics applicants with ability to teach astronomy, applied physics and/or computer science desirable. Candidates must demonstrate strong communication skills. Minority applicants are encouraged. Submit letter of application, resume, transcripts, and at least three letters of reference by June 6, 1988 to Dr. David John, Missouri Western State College, 4525 Downs Drive, St. Joseph, MO 64507. An Equal Opportunity Employer.

SUNY COLLEGE AT ONEONTA,

Dept. of Math'l. Sciences, Oneonta, NY 13820. TWO POSITIONS, subject to budgetary approval. COMPUTER SCIENCE: Ph.D. in Computer Science or related area. Master's level expertise in Computer Science necessary. Preferred specialization in System Software, Operating Systems or Data Base Systems. Background in discrete mathematics and/or numerical analysis desirable. Available August, 1988 or January 1989. MODERN APPLIED MATHEMATICS: Ph.D. in Mathematics and excellent teaching qualifications. Specialization in combinatorics, graph theory, modeling, numerical analysis. Computer science background desirable. Available August, 1988 or January 1989. Rank and salary negotiable/competitive. Duties: undergraduate instruction and related work. Send resume, three letters of recommendation and transcript to Chair, address above. AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER.

BETHEL COLLEGE, MATH & COMPUTER SCIENCE DEPT.
3900 BETHEL DRIVE, ST. PAUL, MN 55112

Bethel College has two full-time, tenure-track positions in the seven-member department of Math and Computer Science. One is for a Ph.D. in mathematics education, the other for a Masters or Ph.D. in computer science or related field, Candidates must be stronly committed to the educational mission and evangelical Christian orientation of the college. Write to: Dr. Dwight Jessup, Vice President for Academic Affairs.

MILLSAPS COLLEGE
DEPARTMENT OF MATHEMATICS
JACKSON, MS 39210

Applications are invited for a tenure track position starting Fall 1988. Candidates must possess a PhD in Mathematics and a dedication to quality teaching. Rank is open and salary will be competitive. Candidates from all areas of mathematics are encouraged to apply. Submit a letter of application, resume, and three letters of recommendation to Dr. Cecil E. Robinson, Jr., Chair, Department of Mathematics, Millsaps College, Jackson, MS 39210. Applications will be considered until the position is filled. Millsaps College is an Equal Opportunity Employer and encourages applications from women and minorities.

MATHEMATICS.

Applications are being accepted for a full-time position in mathematics beginning August, 1988. Responsibilities include teaching undergraduate courses in mathematics with the opportunity to develop a bachelor's degree program in mathematics to begin fall, 1989. Ph.D. in mathematics required; teaching experience preferred. Salary is commensurate with experience. Application requirements: Vita, transcripts, and three current letters of professional reference. Submit applications to : Lewis Hall, Division of Mathematics, Lees-McRae College, Banner Elk, NC, 28604. EOE.

Mathematical Sciences Department at Morningside College, Sioux City, IA., anticipates tenure track opening to start August 24, 1988. Teach 24 semester credits per year in math. Other staff teach Computer Science and pre-calculus math. MS required, PhD preferred. Commitment to liberal arts and broad interest in math are essential. Excellence in teaching is the top priority. Active role in department desired. Salary competitive with other liberal arts colleges. Call Jessie Zellmer at 1–800–831–0806 (or 1–800–352–4931 in Iowa). Detailed position description and application guidelines will be sent.

MATHEMATICS: YEAR 2000

The National Research Council in Washington, D.C. is seeking a staff officer to manage the project, "Mathematical Sciences in the Year 2000: Assessment for Renewal in U.S. Colleges and Universities." This project will develop a national plan for college and university mathematics to enhance the flow of talent, renew the faculty, reinvigorate teaching and scholarship, and make fundamental changes in the curriculum.

Ph.D. or equivalent in mathematics or a related field and four or more years of related experience is required. Applicant should also have demonstrated research, technical, and/or policy analysis capability, effective written and oral communication skills and be recognized by senior practitioners in the field for scientific and technical achievements.

Please reply by mail to Dr. M. Sward, Executive Director, MSEB, National Research Council, 2102 Constitution Ave., N.W., Washington, D.C. 20418. EOE/AA.

Colorado Mountain College, Steamboat Springs, Colorado, is accepting applications for an anticipated vacancy for the position of Faculty-Mathematics. For information regarding minimum qualifications and application procedure call 303–945–8691 by June 24, 1988. CMC is an EOE/AA/m/f/v/h.

HIRAM COLLEGE
MATHEMATICAL SCIENCES DEPARTMENT

The Mathematical Sciences Department of Hiram College invites applications for a faculty position beginning September, 1988. A tenure track appointment requires a Ph.D., or evidence that it will be completed within three years of the initial appointment date. Otherwise, a one year appointment with the possibility or renewal will be made. Demonstrated evidence of excellence in teaching and an active interest in remaining current in the mathematics field is required. Rank and salary are open.

Duties include teaching seven courses per year in mathematics at all undergraduate levels and working closely with students. The ability to teach courses in statistics or computer science is desirable but not required.

Hiram College is a small, selective Liberal Arts college located on a rural campus in northeast Ohio, about 35 miles from Cleveland. Send a resume, transcripts, and three letters of reference from persons familiar with your teaching to Dr. O. Slotterbeck, Chair, Mathematical Sciences Department, Hiram College, Hiram, OH 44234. Hiram College is an Equal Opportunity/Affirmative Action Employer.

The Department of Mathematics at Ferris State University invites applications for a tenure-track teaching position. Applicants must have a Master's Degree in Mathematics or Mathematics Education, strong course work in mathematics, and demonstrated excellence in college teaching. A doctorate in Mathematics or Mathematics Education is desired. Responsibilities include teaching at most levels of mathematics and advising students in science-oriented curricula. Opportunity exists for development of special interests in areas of applied mathematics, mathematics education, computer science, or pre-college mathematics. Send resume, transcripts, and three letters of reference to: Dr. Robert Kosanovich, Department of Mathematics, Ferris State University, Big Rapids, Michigan, 49307. An Equal Opportunity/Affirmative Action Employer.

The University of Scranton
Department of Mathematics/Computer Science

The University of Scranton is a Jesuit university with over 3500 undergraduates. At least one tenure track position is available in Fall 1988 for faculty interested in a teaching environment. Individuals with expertise in any area of mathematics or computer science will be considered. Research is encouraged and supported through a strong faculty development program. Rank and salary are open and competitive. The department currently has 20 full time faculty and about 400 majors. The University has a campus-wide commitment to computing including a faculty PC purchase program. Submit a vita, transcripts and three references to Mathematcs/Computer Science Search Committee, University of Scranton, Scranton, PA 18510 or phone (717) 961–7774. An AA/EO Employer and Educator.

FOCUS

FOCUS (ISSN 0731-2040) is published by the Mathematical Association of America, 1529 Eighteenth Street, N.W., Washington, D.C. 20036, six times a year: January-February, March-April, May-June, September, October, November-December.

Editor: Peter Renz, MAA Associate Director.
Associate Editors: Donald J. Albers, Menio College; David Ballew, Western Illinois University.
Managing Editor: Harry Waldman
Advertising Manager: Siobhán Chamberlin

Chairman of the MAA Newsletter Editorial Committee:
Paul Zorn, 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.

The annual subscription price for *Focus* to individual members of the Association is $3, included as a part of the annual dues. Annual dues for regular members (exclusive of annual subscription prices for MAA journals) are $29. Student, unemployed, emeritus, and family members receive a 50% discount; new members receive a 30% discount for the first two years of membership.

Second-class postage paid at Washington, D.C. and additional mailing offices.

Postmaster: Send address changes to Membership/Subscriptions Department, Mathematical Association of America, 1529 Eighteenth Street, N.W., Washington, D.C. 20036.

Printed in the United States of America.

MAP COLORING, POLYHEDRA, AND THE FOUR-COLOR PROBLEM

David Barnette

This book shows the reader the powerful and diverse mathematical ideas that were developed during the hundred year assault on the four-color problem.

184.pp.,Hardbound, 1984,
ISBN 0-88385-309-4

List: $33.00 MAA Member: $25.00

Catalog Number DOL-08

The author presents a lucid account of the history of the four-color conjecture, and some of the mathematics developed in an attempt to solve the four-color problem. He includes many exercises and their solutions which help the interested reader to gain insight into the theory.

Ruth Bari in *Mathematical Reviews*

MAXIMA AND MINIMA WITHOUT CALCULUS

Ivan Niven

Offers noncalculus solutions to a wide variety of maxima and minima problems arising in diverse areas.

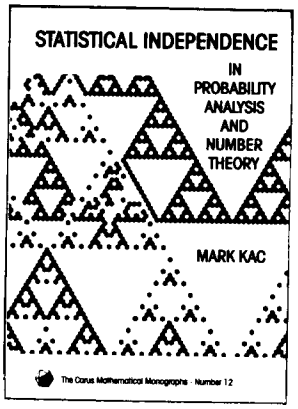
323 pp., Hardbound, 1982, ISBN 0-88385-306-X

List: $31.50 MAA Member: $23.75

Catalog Number DOL-06

A book superb in its exposition and teaming with a variety of elegant mathematical results . . .All instructors in calculus courses should keep this book within easy reach and administer generous doses of its contents to students who are seized by a fit of differentiation frenzy when confronted with any kind of extremum problem.

G.D. Chakerian in *Mathematical Reviews*



Now in Paperback....

STATISTICAL INDEPENDENCE IN PROBABILITY, ANALYSIS, AND NUMBER THEORY

Mark Kac

Read what your colleagues said about this book on the occasion of its publication in paperback.

Terrific, friendly, and profound.

Persi Diaconis

A masterly celebration of the unity of mathematics.

Ian Stewart

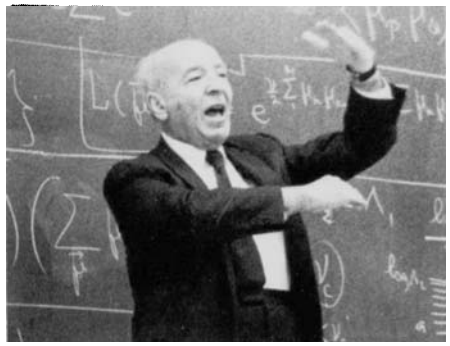
This is a splendid book. It ranges from the primitive idea of statistical independence to applications of the most diverse sort: coin-tossing, anharmonic oscillations, prime numbers, and continued fractions. And it does all that with Kac's customary clarity and charm. Every friend of probability should have it.

Henry McKean

112 pp., 1969, ISBN 0-88385-012-5

List: $12.50 MAA Member $10.00

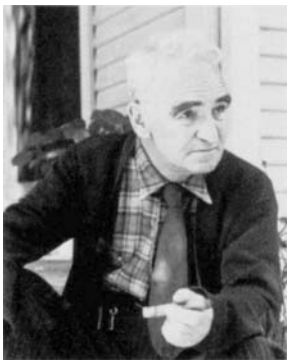
Catalog Number CAM-12



MATHEMATICS AND BIOGRAPHY

Bell is a lively, stimulating, writer, inoffensively crotchety and opinionated, with a good sense of historical circumstance, a fine impatience with humbug, a sound grasp of the entire mathematical scene, and a gift for clear and orderly explanation.

James R. Newman in *The World of Mathematics*



MATHEMATICS: QUEEN AND SERVANT OF SCIENCE

E.T. Bell

An absorbing account of pure and applied mathematics from the geometry of Euclid to that of Riemann and its application in Einstein's theory of relativity. The twenty chapters treat such topics as: algebra, number theory, logic, probability, infinite sets and the foundations of mathematics, rings, matrices, transformations, groups, geometry, and topology. Republished in 1987 with corrections and an added Forward by Martin Gardner.

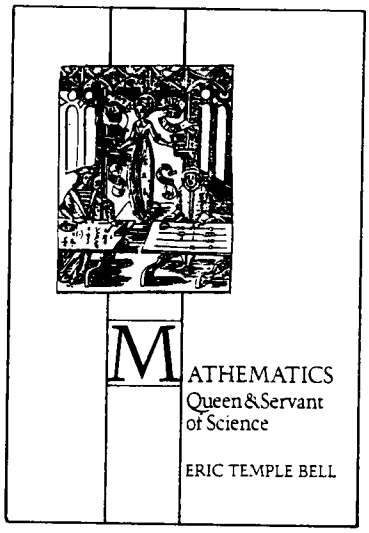
454 pp., ISBN 0-88385-446-3 Paperbound

List: $18.50 MAA Member: $14.00

Catalog Number QAS

The book deserves a place in today's market. It is a much more popular work than most histories of the subject, and that is exactly what makes it accessible to students as well as to nonmathematicians. It is rewarding reading for . . . teachers and students at all mathematical levels.

Morris Kline of The Courant Institute



JOIN MAA TODAY!

Send this application to: MAA Membership Department
1529 18th Street, N.W.
Washington, D.C. 20036

Name _____

Mailing Address _____

_____ Zip _____

Employer/School _____

Position (Rank) _____

Employer's City/State _____

Highest Earned Degree _____ Year Degree Earned _____

Institution Awarding Degree _____

Month/Year of Birth _____

Have you been a member of the MAA before? ☐ **Yes** ☐ **No**

Your membership may begin on July 1 or January 1. You may elect to receive any of the listed combinations of the three MAA journals. All members receive *Focus,* the MAA newsletter.

Please **circle** the appropriate box corresponding to your initial membership period and the selection of journals you wish to receive. (Rates are guaranteed for the indicated periods only.) Subscription prices are included with dues (see **).

THE AMERICAN MATHEMATICAL MONTHLY **(M)**
MATHEMATICS MAGAZINE **(G)**
THE COLLEGE MATHEMATICS JOURNAL **(J)**

	M	G	J	M + G	M + J	G + J	M + G + J
Student Membership							
1 year (Jan.-Dec. 1989)	$29.00	$23.00	$25.00	$36.00	$38.00	$31.00	$ 44.00
1½ year (July 1988-Dec. 1989)	$43.50	$34.50	$37.50	$54.00	$57.00	$46.50	$ 66.00
Regular Membership							
1 year (Jan.-Dec. 1989)	$48.00	$35.00	$39.00	$61.00	$65.00	$52.00	$ 78.00
1½ year (July 1988-Dec. 1989)	$72.00	$52.50	$58.50	$91.50	$97.50	$78.00	$117.00

*Student membership available to high school and undergraduate students and to students regularly enrolled in graduate study at least half time. Enclose letter from school or department official confirming status. Student rates apply to unemployed persons who are seeking employment.

**Annual dues include subscription prices as follows: Regular Member $26 (M), $17 (J), $13 (G), $3 *(Focus)*. Student Member $13 (M), $9 (J), $7 (G), $1 *(Focus)*.

Payment Enclosed $ _____ *U.S. Funds Only* (see blow)

METHOD OF PAYMENT ☐ Check Enclosed ☐ VISA ☐ MasterCard ☐ Bill me

Card Number _____ Expiration Date |__|__|__|__| *(month/year)*

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

SIGNATURE _____

Mathematics and the Public *(continued from page 1)*

CONVERSATIONS Many otherwise well-educated citizens still think of mathematicians as number crunchers and whizzes at income tax. Counterattack. Ask whether *their* difficulty with the tax is in performing the arithmetic on a calculator or following the instructions. Ask how they picture you crunching numbers and why they think you're doing it. Announce that mathematics is a living subject with many branches. (MATHEMATICAL REVIEWS classifies articles under some 60 major headings, divided into 4000 specialized topics; they come from 1600 journals around the world, half of them devoted exclusively to mathematics.)

When you're asked what your specialty is, don't drop the conversation. Your questioner has expressed some interest in mathematics. Maintain the dialog but steer away from technicalities. It might be, for example, that the problem lies in one field but methods of attack come from another; that's interesting, and you may even quote the names of the fields. Then turn the discussion to a viable level. Recall the angle-trisection problem, for example, which your listener has probably heard of, and point out that it was finally settled by converting it to a problem in algebra, where the advanced theory of equations just developed could be brought to bear.

My neighbor on the plane asked, "What *is* calculus?" I know the pitfalls of saying too much and assuming too much and I think I could be good at explaining mathematics to the educated citizen. Until that moment, I thought I was already good at it. I told him that if you go at a steady speed of 40 miles per hour, then after 1 hour you have gone 40 miles and after 2 hours you have gone 80 miles, and that this is school mathematics; but if your speed is not constant but changes from moment to moment, perhaps according to some complicated formula, then the analysis is out of reach of school mathematics, and this is where calculus comes in. I emphasized that this setting is only one of many that require calculus but is typical in that it involves variable rates; calculus is a collection of sophisticated concepts and methods developed to handle just such situations. That was one grand new idea and was plenty. But instead of stopping there, I went on to mumble something about "limiting processes," thereby jumping into two traps: trying to indicate what the new methods were, and using a technical word. The moment of truth arrived when my friend, summarizing what he had just learned, referred to the *limitations* under which we work.

LETTERS TO THE EDITOR A cartoon shows two old geezers—typical cartoon professors—at the blackboard, chalk in hand, with the caption, "I'll race you on 27,904,263 times 308,451,061,703." This serves to perpetuate the notion that professors spend their time that way. (If it was intended instead to ridicule the notion, that was lost on the nonmathematicians I checked with.) Particularly in the age of computers and word processors, the concept is as inane as a race on copying a page from the dictionary by hand. The cartoon appeared in THE CHRONICLE OF, you'll excuse the expression, HIGHER EDUCATION (October 7, 1987). Always write to the editor to protest such atrocities.

Calvin Trillin, a syndicated "humorist," regrets that the Texas legislature did not stick to its decree that $\pi = 3$. My newspaper garbles a report on the digits of π, stating that mathematicians compute them for clues to whether they eventually cycle forever. Are such statements worth challenging? *Yes.* One professor did respond, in humorless academic style, explaining that mathematicians have known for a long time that is irrational and in fact transcendental, defining these terms, and referring the reader to the literature. The letter was not published, perhaps because it seemed too heavy; certainly the transcendental bit was gratuitous. Still, the editor erred. We might have saved a soul. Some 14-year-old, perhaps a girl, could have said to herself, "Hey, wait a minute! I measure around this circle and I measure across the circle, and I divide and get π. What does that have to do with integers or decimals? How can anybody *know* that isn't *any* fraction, or that the digits will *never* cycle? Maybe mathematics is pretty interesting stuff after all." The editor could not be expected to think this through—so the writer erred by not raising the questions himself.

LECTURES An enterprising high school teacher sends her students to interview mathematicians at the local college; the professors enjoy it, and the students learn that some mathematicians are real people (as indeed many of us are). • On a larger scale, college faculty can arrange to give talks at the high and junior high schools. (*Warning.* These circumstances represent a different world from your college class: now you have to be *really* entertaining.) Speak for 15 minutes about how you spend your day (intone that in order to do serious mathematics, one has to be very well organized—then show a slide of your messy desk), and tell what kinds of problems you think about and why mathematics is important. Then devote 15 minutes to an actual mathematical idea. Proportion, for example. Mention that the radius of the sun is 100 times that of the earth, which is four times that of the moon (which is 1000 miles); then compare diameters, circumferences, areas, and volumes. Illustrate the magnitudes with examples closer to home; e.g., a million hours is more than a hundred years. Conclude with a question period. (Bone up on the size of the Pacific Ocean.) Radiate enthusiasm throughout. • Alternatively, speak for 25 or 30 minutes on an interesting application of mathematics, interspersing your remarks with well-crafted transparencies or slides. An outstanding example is the new treatment for crushing kidney stones known as *extracorporeal shockwave lithotripsy.* An ellipsoidal reflector cup with an electrode at one focus is positioned so that the stone is at the other focus. Shock waves generated by the electrode are reflected to the stone and pulverize it, but spare other tissue. The patient recovers in a few days, in contrast to the several months required after surgery. [COMAP NEWSLETTER #20, November 1986.] • Give a talk at the PTA, too. If you're brave, try the Chamber of Commerce.

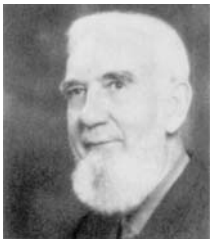
ARTICLES Magazines of every description—national and local, highbrow and popular, including opinion magazines, Sunday sections, airline flight magazines with their semi-captive readership, and high school newsletters—are targets for mathematical articles. The space otherwise goes by default to pop pieces that "make good copy." Here are two possibilities. **Angle trisection** Emphasize the ruler-and-compass conditions. • Distinguish between trisecting a particular angle vs. all angles: thus the theorem states that at least one angle cannot be trisected. • Distinguish between not knowing how to do something and proving it can't be done. Learn when to tell a white lie: if you do mention that trisecting a 120°-angle turns out to require solving a cubic, suppress the word "irreducible." • Observe that the other two famous problems of antiquity are also solved with the help of algebra. Regarding the "theory" of equations, point out that in mathematics, the word does not connote speculation but a body of knowledge: everything in a mathematical theory is true. **The number π** • Observe that the equivalence of the two definitions of rational is a topic for second-year algebra in high school. Suggest dividing 22 by 7 and watching what happens. Mention that the proof of irrationality uses calculus and is accessbile to college students who have had the course and who are able to maintian their concentration for a full hour. • Recall the numbers 22/7 and 3.1416 commonly used for and note that they are rational, so can only be approximations. Many people think they are equal; are they? Explain that finding π to a huge number of places depends on formulas from calculus and that the object is hints to the relative frequencies of the digits. • Highlight the fact that π appears in many unexpected places in mathematics, such as the formula for the distribution of SAT scores and the analysis of musical tomes, and that many other seemingly unrelated ideas in mathematics turn out to be connected to one another in surprising and beautiful ways.

Meritorious Service Awards

Presented in Salt Lake City

Six individuals who have given extraordinary service to their Sections were awarded Certificates for Meritorious Service at the MAA Business Meeting in Salt Lake City, Utah last August. Each year, six MAA Sections are invited to select a member to be honored nationally. The first awards were made in August 1984.

The names and affiliations of the individuals honored in 1987 and brief biographical sketches follow:



TEXAS SECTION
Robert E. Greenwood
University of Texas at Austin

A member of the Association since 1939, Dr. Greenwood has a long history of service as an enthusiastic and dedicated leader in the Texas Section which includes service as a Visiting Lecturer (1962–68) and as a member of the William Lowell Putnam Mathematical Competition Committee (1956–59) (1965–67) and as Chairman of the committee in 1959 and 1967. In addition, he served as a referee and reviewer for MATHEMATICS MAGAZINE and the AMERICAN MATHEMATICAL MONTHLY and, for 9 years, was the MAA campus representative to the University of Texas.

Dr. Greenwood helped found the American Archives of Mathematics and since his retirement in 1981 has been serving as unofficial historian for the Mathematics Department of the University of Texas at Austin. In his teaching career, Dr. Greenwood supervised 57 M.A. theses and was the supervising professor for 10 Ph.D. dissertations. He is co-author and co-editor of the MAA volume covering the Putnam Competitions for 1938–1964.

MICHIGAN SECTION
Yousef Alavi
Western Michigan University,
Kalamazoo, Michigan

Yousef Alavi has been a leader in the Michigan Section for over 30 years, with an unmatched record as an organizer and supporter of section activities. He has been elected to the offices of Secretary-Treasurer, Chair, Executive Committee member, and member of the Board of Governors. Dr. Alavi founded the Michigan Newsletter and twice served as its editor and in the fall of 1986 he wrote the "History of the Michigan Section" which appeared in the Michigan Newsletter.

Dr. Alavi instituted the Michigan High School Visiting Lectureship program and has participated in the Michigan Mathematics Prize Competition since its inception in 1958. Dr. Alavi's service to the MAA includes two terms on its Board of Governors and service on committees, including the Committee on Sections, the Editorial Board ofFOCUS, and chairing the Public Information Panel. The breadth of Yousef Alavi's contributions is suggested by the concurrent resolution of tribute to Dr. Alavi, in recognition of his outstanding contributions to mathematics, learning, and students, that was passed in the House of Representatives and Senate of the State of Michigan in April of 1987.

ROCKY MOUNTAIN SECTION
David Ballew
Western Illinois University, Macomb, Illinois

David Ballew was an innovative and tireless leader of the Rocky Mountain Section for nineteen years prior to his becomming Chair of the Department of Computer Science at Western Illinois University in Macomb. He was a primary source of guidance for section activities and policy matters during his terms as section secretary (1971–1986) and newsletter editor (1975–1986) and played an integral part in the impressive growth in membership in the Rocky Mountain Section. Dr. Ballew's service to the MAA includes chairing the Committee on Sections, serving as an associate editor of FOCUS, and as a member of the Committee on the 75th Anniversary and Committee on Service Courses. He has been elected President of Pi Mu Epsilon and served as chairman of the Joint Policy Board for Mathematics Committee on Department Chairs.

KANSAS SECTION
Arnold M. Wedel
Bethel College, North Newton, Kansas

Arnold M. Wedel served the Kansas Section as Chairman in 1960–61 and as Governor in 1970–73. Fifteen of his students have Ph.D.'s in mathematics and many others have received doctorates in education or mathematics education. Others have gone on in careers related to mathematics and actuarial science.

He helped establish a cooperative mathematics program between three nearby colleges. He has brought well known mathematicians to his campus regularly and has encouraged his students to participate in competitive examinations. Bethel students have consistently scored well on the Putnam examination. The Bethel College mathematics department has maintained high standards and the quality of the students who have graduated in mathematics shows it.

FLORIDA SECTION
The late Frank L. Cleaver
University of South Florida, Tampa, Florida

Frank Cleaver, one of the organizers of the Florida Section, became its Secretary-Treasurer in 1970. For 13 years, he planned the meetings, initiated and wrote the Newsletter with information he had collected from the schools of Florida, and encouraged participation from instructors at all levels. He helped develop and implement the concept of the Regional Meetings, and worked to provide uniformity of standards of mathematics instruction throughout the state system of higher education. In the critical years of the fast development of Florida's system of higher education, Frank Cleaver's influence was of major significance. Dr. Clever died on January 29, 1987.

NORTHEAST SECTION
Donald Small
Colby College, Waterville, Maine

Donald Small exemplifies the consistent effective leadership that has sustained and helped the Northeast Section develop into one of the most active in the Association. In addition to serving as Governor (1982–85), Chairman (1977–1979), and Vice-Chairman (1975–1977) of the Northeast Section, Dr. Small served as chair of the folowing committees: Advisory Committee, Women and Mathematics Program (1974–1986), Advisory Committee, Blacks and Mathematics Program (1977–1986), the CUPM Panel on Calculus Articulation (1983–1986), the Committee on Secondary School Lecturers (1973–1984) and the Northeast Section of MAA Short Course Program (1979-present).

15–26. **TeX Users Group's Annual Conference**, McGill University, Montreal, Canada. The general theme of the meeting will be "Using TeX in Production Environments. Program inquiries should be directed to: Dean Guenther, Washington State University, Pullman, Washington 99164–1220; (509) 335–0411. Requests for additional information about the conference, courses, and registration should be directed to: TeX Users Group, P.O. Box 9506, Providence, Rhode Island 02940; (401) 272–9500, ext. 232.

October 1988

19–21. **Conference on Iterative Methods for Large Linear Systems**, The University of Texas at Austin, Austin, Texas. This conference will be dedicated to providing an overview of the state of the art in the use of iterative methods for solving sparse linear systems with an eye to contributions of the past, present, and future. The emphasis will be placed upon identifying current and future research directions in the mainstream of modern computing. For more information, contact: Center for Numerical Analysis, RLM Building 13.150, University of Texas at Austin, Austin, Texas 78713–8510; (512) 471–1242; Arpanet: kincaid.

27–30. **14th Annual AMATYC Convention**, Palliser Hotel, Calgary, Alberta, Canada.

5–8. **Second Boston Workshop for Mathematics Faculty**, Wellesley College, Massachusetts. Goal: to strengthen undergraduate teaching, including new efforts in calculus and linear algebra. For more information, contact: Gilbert Strang, Room 2–240, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139.

Hirzebruch and Hormander to Receive Wolf Prizes

The 1988 Wolf Prizes will be awarded May 12 to Friedrich Hirzebruch of the Max Planck Institut and the University of Bonn and to Lars Hormander of the University of Lund. Hirzebruch is being honored for his contributions over the last 35 years to topology, algebraic geometry, and global differential geometry and for the great stimulation that his lectures, writing, and conferences have provided. Hirzebruch's contributions have been broad and marked by an interest in the beautiful particular case or concrete problem solved by creating new methods combining unusual geometric, algebraic, and arithmetic intuitions.

Hormander is being honored for his many contributions to linear partial differential equations. These were honored earlier by the award of a Fields Medal in 1962; since then he has played a key role in the development of the modern machinery of the subject: including pseudodifferential operators and Fourier integral operators. He has also made substantial contributions in the area of functions of several complex variables.

Six Wolf awards of $100,000 each are given annually for outstanding achievements in physics, chemistry, medicine, mathematics, and the arts.

These awards not only reward the individuals honored but also serve to direct attention to their important bodies of work.

The Association for Women in Mathematics is preparing a new speakers' bureau which lists women and men who are available to speak about subjects related to women and mathematics. If you are interested in speaking, please contact: AWM, Box 178, Wellesley College, Wellesley, Massachusetts 02181; (617) 235–0320, ext. 2643.

Undergraduate Research Program at NSF Expanded in 1988

Last year the NSF funded 8 institutions for its Research Experiences for Undergraduates program. This year the program has been expanded to 14 sites offering a varied group of programs.

University of Tennessee, Professor Lawrence S. Husch, Knoxville, Tennessee 37916, many areas offered, (12 students); **Rice University**, Professor B. Frank Jones, Jr., Box 1892, Houston, Texas 77251, Laplace operators on spheres, (8 students); **Fordham University**, Professor Robert H. Lewis, Bronx, New York 10458, Matrices for topological applications, (4 students); **Indiana University of Pennsylvania**, Professor George E. Mitchell, Indiana, Pennsylvania 15705, Discrete chaotic dynamical systems, (8 students); **Mount Holyoke College**, Professor Donal B. O'Shea, Clapp Laboratory, South Hadley, Massachusetts 01075, Algebraic geometry, PDE's, and statistics, (12 students); **University of Clolorado**, Professor James H. Curry, Campus Box 426, Boulder, Colorado 80309, Geometry of iteration maps and parallel computation, (10 students); **University of Washington**, Professor Charles N. Curtis, Seattle, Washington 98195, Numerical PDE's, (8 students); **University of Minnesota at Duluth**, Professor Joseph A. Gallian, Duluth, Minnesota 55812, Graph theory, (6 students); **Harvey Mudd College**, Professor John Greever, Claremont, California 91711, Applied mathematics, (8 students); **Worcester Polytechnic Institute**, Professor David L. Housman, Worcester, Massachusetts 01609, Discrete applied math, (9 students); **Oregon State University**, Professor Paul Cull, Corvallis, Oregon 97331, Computer explorations in number theory and dynamics, (10 students); **Moravian College**, Professor Fred B. Schultheis, Bethlehem, Pennsylvania 18018, Reciprocity laws in algebraic number theory, (4 students); **Texas Southern University**, Professor Willie E. Taylor, Jr., Houston, Texas 77004, Differential and difference equations, (10 students); **California Institute of Technology**, Professor Richard Wilson, Pasadena, California 91125,Combinatorics, (4 students)

Calendar

National MAA Meetings

72nd Annual Meeting, Phoenix, Arizona, January 11–14, 1989. (Board of Governors, January 10, 1989).

Section MAA Meetings

Louisiana-Mississippi, Mississippi State University, Mississippi State, Mississippi, February 24–25, 1989. (To be held in Biloxi, Mississippi).

North Central, Concordia College, Moorhead, Minnesota, October, 1988.

Northeastern, St. Michael's College, Winooski, Vermont, June 10–11, 1988. Rhode Island College, Providence, Rhode Island, November 18–19, 1988.

Ohio,Wittenberg University, Springfield, Ohio, Fall, 1988

Pacific Northwest, University of British Columbia, Vancouver, British Columbia, June 16–18, 1988.

Seaway, Syracuse University, Syracuse, New York, Fall, 1988.

Other Meetings

May 1988

26–28. **Third Lehigh University Geometry and Topology Conference**, Bethlehem, Pennsylvania. For more information, contact: D. Davis or D. Johnson, Department of Mathematics, Lehigh University, Bethlehem, Pennsylvania 18015; (215) 758–3730.

June 1988

6–10. **Maryland-DC-Virginia Section Workshop:** "Fractals and the Microcomputer," Salisbury State College, Salisbury, Maryland W.D. Withers of the United States Naval Academy will conduct this workshop. Topics include: Basic fractals; refinements of iternated function systems; fractal measures; fractal interpolation; Julia sets and the Mandelbrot set; and fractals in the classroom. For more information, contact Dr. B.A. Fusaro, Salisbury State College, Salisbury, Maryland 21801; (301) 543–6471.

13–17. **Maryland-DC-Virginia Section Workshop:** "Program Design and Data Abstraction," Salisbury State College, Salisbury, Maryland. W.J. Collines of Radford University will conduct this workshop. Topics include: Algorithm Design; Data Types and Data Abstraction; "Stack" Data Type; and Data Abstraction and Discrete Mathematics. For more information, contact: Dr. B.A. Fusaro, Salisbury State College, Salisbury, Maryland 21801; (301) 543–6471.

13–17. **Northeast Section Short Course:** Franl Giordano of the U.S. Military Academy, West Point and Maurice Weir of the Naval Postgraduate School, Monterey will lecture on "Teaching of Mathematical Modeling in Undergraduate Mathematics" at the University of Maine, Orono, Maine. For more information, contact: Clayton Dodge, University of Maine, Orono, Maine 04469; (207) 581–3908.

13–17. **Eastern Pennsylvania and Delaware Section Workshop:** "Applied Math via Classroom Experiments," Messiah College, Grantham, Pennsylvania. Herbert R. Bailey of the Rose-Hulman Institute of Technology will conduct this workshop. Topics include appropriate experiments and analysis of the resulting models for several physical science problems—linear motion, projectile motion, rotational motion, collisions, fluid flow, heat flow, and Calculus of Variations type problems. For more information, contact Professor Marvin Brubaker, Messiah College, Grantham, Pennsylvania 17027; (717) 766–2511.

20–24. **Eastern Pennsylvania and Delaware Section Workshop:** "History of the Calculus." See Calculus Watch on page TK.

20–24. **Conference on Matrix Spectal Inequalities**, The Johns Hopkins University, Baltimore, Maryland. The principal lecturer, Robert C. Thompson, will give 10 lectures on inequalities for eigenvalues, singular values, and invariant factors with applications to control theory and functional analysis. Apply now, but now later than April 8, 1988 to ensure consideration for on-campus housing and financial support. For more information, contact: Roger Horn, Department of Mathematical Sciences, The John Hopkins University, Baltimore, Maryland 21218.

26-July 16. **Workshop in Writing and Thinking for High School Students**, Simon's Rock of Bard College, Great Barrington, Massachusetts. This workshop offers students intensive practice in creative and critical writing, collaborative learning, and reading and writing across the disciplines. For more information, contact: Dr. Jamie Hutchinson, Writing and Thinking Workshop, Simon's Rock of Bard College. Great Barrington, Massachusetts 01230; (413)528–0771.

July 1988

6–8. **Workshop on the Role of Mathematicians in Education Reform**, University of Illinois at Chicago, Chicago, Illinois. This workshop will consider "Facilitating the involvement of mathematicians and mathematics educators in pre-college educational improvement projects." Presenters include: Tom Berger of the University of Minnesota; Franklin Demana of Ohio State University; Harvey Keynes of the University of Minnesota; Katherine Pedersen of Southern Illinois University; Uri Treisman of the University of California at Berkeley; and Philip Wagreich of the University of Illinois at Chicago. For more information, contact Kay Poyner Brown, Department of Mathematics, MC 249, University of Illinois at Chicago, Box 4348, Chicago, Illinois 60680; (312)996–2438.

6–9. **Allegheny Mountain Section Short Course:** "Applications of Graphs and Relations," Allegheny College, Meadville, Pennsylvania. Fred S. Roberts of Rutgers University will present eight lectures on such topics as applications of graph coloring, T-colorings of graphs, applications of Eulerian chains and paths, competition graphs and their applications, relational systems and the theory of measurement, meaningless statements, representation and uniqueness theorems, and possible merging fuctions. For more information, contact: Richard McDermot, Allegheny College, Meadville, Pennsylvania 16335 or Dave Well, Penn State University, New Kensington, Pennsylvania 15068.

11–15. **Rocky Mountain Section Short Course:** "Mathematical Modeling," Fort Lewis College, Durango, Colorado. Frank R. Giordano and Maurice D. Weir will present this short course with a focus on pedegogy and content for undergraduate courses in mathematical modeling. For more information, contact Gary Grefsrud, Fort Lewis College, Durango, Colorado 81301; (303) 247–7336.

August 1988

1–6. **1988 AMATYC Summer Institute**, Ricks College, Division of Continuing Education, Rexburg, Idaho. Courses include: Math Application vs. Classroom Experiments and Teaching Strategies. $25.00 deposit by 31 May 1988 will ensure a reservation. For more information, contact Larry Saunders or Steven Terry, Ricks College, Rexburg, Idaho 83440; Saunders: (208) 356–1466 (work) or (208) 356–3816 (home); Terry: (208) 356–1406 (work) or (208) 356–3091 (home).

1–20. **Oxford Course on the History of British Mathematics.** "On the Shoulders of Giants: A History of British Mathematics" will again be offered at Oxford University. See FOCUS, Volume 7, Number 1, January-February, 1987 or write to the instructor: Professor Paul Wolfson, Department of Mathematical Sciences, West Chester University, West Chester, Pennsylvania 19383 for details.

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

Second class postage paid at Washington, D.C. and additional mailing offices.