FOCUS

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In this Issue

The Mathematical Association of America
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Martin Gardner Receives JPBM Communications Award

Martin Gardner has been named the 1994 recipient of the Joint Policy Board for Mathematics Communications Award. Author of numerous books and articles about mathematics, Gardner is best known for the long-running "Mathematical Games" column in *Scientific American*. For nearly forty years, Gardner, through his column and books, has exerted an enormous influence on mathematicians and students of mathematics.

When asked about the appeal of mathematics, Gardner said, "It's just the patterns, and their order—and their beauty: the way it all fits together so it all comes out right in the end."

Gardner graduated Phi Beta Kappa in philosophy from the University of Chicago in 1936, and then pursued graduate work in the philosophy of science. In 1941, he enlisted in the United States Navy and served until the end of the Second World War. He began his *Scientific American* column in December 1956.

The MAA is proud to count Gardner as one of its authors. He has published four books with the Association, with three more in the pipeline. This September, he begins "Gardner's Gatherings," a new column in *Math Horizons*.

Previous JPBM Communications Awards have gone to James Gleick, author of *Chaos*; Hugh Whitemore for the play *Breaking the Code*; Ivars Peterson, author of several books and associate editor of *Science News*; and Joel Schneider, content director for the Children's Television Workshop's *Square One TV*.

Recognition and Rewards in the Mathematical Sciences

Allyn Jackson

This article was also published in Notices of the American Mathematical Society, *May/June 1994, and appears here in slightly different form.*

How can mathematical sciences departments evaluate and reward the full range of faculty activities? How can teaching be evaluated? What constitutes "scholarship"? How should service to one's institution or to the profession be rewarded? How should departments balance research, teaching, service, and scholarship in making decisions about promotions, tenure, and salary increases?

Such questions have long been the subject of debate within the mathematical sciences community and within academia more generally. But today the debate is taking on added urgency as colleges and universities struggle to respond to increasing demands from government and the general public. A number of reports, most notably *Scholarship Reconsidered: Priorities of the Professoriate*, by Ernest Boyer, have explored the question of what constitutes scholarship and what the appropriate balance is between teaching and research.

The mathematical sciences community has attempted to take the lead in examining these issues. The Committee on Professional Recognition and Rewards of the Joint Policy Board for Mathematics was established in 1991 to examine the rewards systems currently in place

*Please see **Rewards** on page 3*

US Places First in 35th International Mathematical Olympiad and Makes History with Six Perfect Scores.

More details in the October FOCUS.

FOCUS

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Editor and Chair of the MAA Newsletter Editorial Committee: Keith J. Devlin, Saint Mary's College of California

Associate Editor: Donald J. Albers, MAA Associate Executive Director, and Director of Publications and Programs

Managing Editor: Harry Waldman, MAA

Production Specialist: Amy Stephenson, MAA

Proofreader: Meredith Zimmerman, MAA

Copy Editor: Nancy Wilson, Saint Mary's College of California

Letters to the editor should be addressed to: Keith Devlin, Saint Mary's College of California, P.O. Box 3517, Moraga, CA 94575, e-mail: devlin@stmarys-ca.edu

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Editorial

The Report on the Recognition and Rewards in the Mathematical Sciences from the Committee on Professional Recognition and Rewards of the Joint Policy Board for Mathematics started landing on the desks of mathematics department chairs in late May and early June. [See the article on the front page.] It is sure to set off considerable discussion in the mathematics community. I am certain that photocopies of various sections will find their way onto the desks of deans and college presidents as mathematicians try to foster change in the way they do business.

One of most hotly debated items is likely to be the means used to evaluate college and university teaching. This is, of course, hardly a new issue, but the new report will undoubtedly rekindle the fire.

I confess that the longer I have been in the business of academic administration (first at department chair level, now as a dean), the less happy I am about the way this is currently done at most institutions.

Maybe I should start by backing up a bit. The early part of my career was spent in Britain, where there were no institutionalized student evaluations of teaching. As a fairly frequent visitor to the USA, often for periods of one or two semesters at a time, where I would teach one or two courses at a time, I went through the familiar end-of-semester student evaluation process, and found it extremely useful.

As a visitor, my career in no way depended on the results, but the process was nevertheless stressful. It is virtually impossible to please all of the people all of the time, and so I would brace myself for the almost inevitable complaints, and just pray that they were few in number.

But for all that the process was stressful, I found it very useful, and I am sure that the feedback I received contributed greatly to better teaching on my part—and I should say that in the traditional teaching versus research debate, I have always come down firmly in the middle, regarding both activities as important and enjoyable (and, for that matter, mutually supportive, though in different ways for the two directions). Student evaluations of teaching are, I am sure, a valuable tool for the instructor. When I returned to the UK after my first spell at a US university, I imported the student evaluation procedure for my own use to gain feedback on my teaching.

The question is, how valuable are student evaluations in terms of judging teaching performance as part of the faculty evaluation process? In my view, this question does not have a simple answer.

Having had experience reading evaluations as a chair, a dean, and a member of a tenure committee, I have no doubt that, when read in an appropriate manner, the forms can provide valuable information. (All the evaluation forms I have had to deal with have provided both statistical information and individual student comments, and it was the combination of the two kinds of information that seemed useful. Statistical data on its own would strike me as being extremely uninformative.)

However, if student evaluations were the only source of information, I would be very uncertain as to how much weight to attach to them. They present a very one-sided view. Moreover, they are written by individuals who, by definition, are not in a position to evaluate many important aspects of teaching, such as does the course cover the really important topics, is it correct, is it up-to-date, is the standard comparable to that at similar institutions?

It is in conjunction with a number of other evaluative mechanisms that the student evaluations help form a reasonably all-round picture. Equally important are peer evaluations (which, to ensure fairness, should be carried out not by a single individual but by groups of two or three faculty, one or more of whom should be chosen by the person being reviewed). Experienced colleagues can see important components of good (or poor) teaching that a student could not.

Rewards from page 1

in mathematical sciences departments and to formulate guidelines to assist departments in making decisions about their rewards systems. With funding from the National Science Foundation and the Exxon Education Foundation, the committee carried out site visits to twenty-six institutions, as well as a survey of nearly 2,000 mathematical sciences faculty and over 600 chairs in departments of various types (including Ph.D.-granting and bachelor's-granting institutions and two-year colleges). In presentations at numerous meetings and conferences, the committee aimed to inform the mathematical sciences community about its work. The culmination of these efforts is the report *Recognition and Rewards in the Mathematical Sciences*, which was released in early May.

The report does not contain a "blueprint" for a rewards system. Indeed, the committee was very much aware that no single rewards system could be workable in all mathematical sciences departments in all kinds of institutions. Rather than making prescriptive recommendations, the report provides guidelines that any department can use as a basis for discussions about how to craft a rewards system that serves well its faculty, its institution, and its constituents. The guidelines could also be used in negotiations between departments and administrations about changes in the rewards system.

The Report's Findings

The first section of the report presents ten findings which describe what the committee observed on its site visits and in its survey. The findings provide a look at rewards systems as they operate in mathematical sciences departments today—how faculty feel about them, what influences rewards systems, how they are changing. As might be expected, research plays a central role in the rewards systems at most institutions, and faculty believe that this is as it should be. The survey asked about the importance to rewards systems of three kinds of research: research in the discipline, interdisciplinary research involving new mathematics, and applications of existing mathematics to other fields. The survey found widespread agreement that research in the discipline is very important. Interdisciplinary and applied research were also viewed as important, though not as important as research in the discipline.

The report indicates that,.despite the general consensus about the importance of research, most faculty would like to see a broader and more flexible rewards structure that values not just research, but also teaching, scholarship, and service. In particular, there is a wide array of activities which many faculty believe should count for more in the rewards system; these activities include classroom teaching, service to the institution or to the profession, interdisciplinary research, research on educational issues, expository writing, and student mentoring and advising. Sometimes the rewards system can actually discourage work in these areas, even when the work is extremely important to the department and the institution. The report particularly notes a "great dissatisfaction about inadequate rewards for faculty's educational responsibilities."

Despite these tensions, there have been changes in the last five to ten years. In particular, the report points out a gradual evolution in mathematical sciences departments along two parallel tracks: departments which traditionally emphasized teaching are placing heavier emphasis on research, while departments which traditionally emphasized research are placing greater emphasis on teaching.

*Please see **Rewards** on page 14*

Letters from past students can also be useful. Indeed, I recall a number of occasions where past students wrote in to say that, although they had been highly critical of Professor X at the time, with hindsight it had become clear that Professor X had been a very good teacher. (Obviously, such letters are only valuable if solicited by the evaluation committee on a random or blanket basis.)

Another important part of the review process, in my opinion, is a discussion between the instructor and the evaluation committee or its chair. What might seem to be negative aspects of a profile could look very different when placed in the context of what the instructor is trying to achieve.

The sum total of my observations so far is that, as part of a more comprehensive evaluation procedure, student evaluations (which should include student comments) can be useful for those charged with the task of evaluating faculty teaching. But now the plot thickens. Evaluation of teaching is not the same as observation of a distant planet through a telescope; the very process of evaluating teaching has a direct, and, in my experience, very significant effect on teaching. It would be a rare individual who, faced with the hurdle of tenure or promotion, could resist the temptation to "teach to the evaluation". And, with the best will in the world, I cannot see the pursuit of glowing student evaluations as necessarily leading to better teaching. Good teaching, that is to say, teaching that is of long-lasting benefit to the student, involves a significant degree of discomfort—the discomfort that comes with pushing beyond what is known and what is familiar. In my experience, enough students react negatively to that discomfort to cause many (most?) young, untenured faculty to ease off, if only subconsciously.

For all its obvious faults as a system of government, democracy is the least terrible. It may be that the same is true for including stylized student evaluations as part of a comprehensive evaluation of teaching. But I don't think this is the case. My own opinion is that we would be better off looking for alternative ways to secure student input. (I am not for a moment suggesting we do not listen to what our students have to tell us.) As things stand right now, I think that we have a system that, by inhibiting good teaching, may do more harm than good to our students' education.

Needless to say, this is just one person's opinion, not a carefully drafted report of a detailed study. My words are designed to prompt thought and debate, not to be used as a recipe. Doubtless, readers of FOCUS will have their own opinions. The pages of FOCUS might be an excellent medium to air those views.

—Keith Devlin

The above are the opinions of the FOCUS editor, and do not necessarily represent the official view of the MAA.

CD-ROM Textbooks and Calculus

Roland E. Larson

This is the second part of an article that began in the June 1994 issue of *FOCUS*. The first part discussed two advantages of a CD-ROM calculus textbook: *storage capacity* and *interactivity*. "Part II" looks at two additional benefits: *use of multimedia* and *nonlinear organization*.

Use of Multimedia: A printed calculus textbook makes use of a single medium, print, to convey information. A multimedia textbook uses print, motion, and sound. You don't have to think much about the potential uses of motion in a calculus textbook before you come up with an exciting list of possibilities: animations, simulations, video clips, and portrayal of three-dimensional objects.

Animated motion can bring life to calculus instruction. For instance, Figure 1 shows an animation of a secant line approaching a tangent line. The animation can be "played" or viewed step-by-step.

As part of a CD-ROM calculus textbook, animations are ideally suited for classroom demonstration and individual student use. In either setting, animations appeal to the visual learner in all of us.

For a calculus instructor who has struggled with chalk drawings or preparation of overhead transparencies, it is easy to imagine dozens of other animations that can assist with the instruction of calculus. Here are a few examples.

- Transformations of graphs in the plane can be animated so that students can "see" vertical shifts, horizontal shifts, and reflections.
- The generation of a solid of revolution can be animated to allow students to see how a two-dimensional region traces out a three-dimensional solid.
- The process of finding the limit of a Riemann sum can be animated to allow students to see how the approximation tends to improve as the maximum subinterval width approaches zero.
- A three-dimensional surface can be animated to rotate in space. This type of animation greatly enhances the illusion of three dimensions.
- The motion of objects such as rockets and automobiles can be animated.

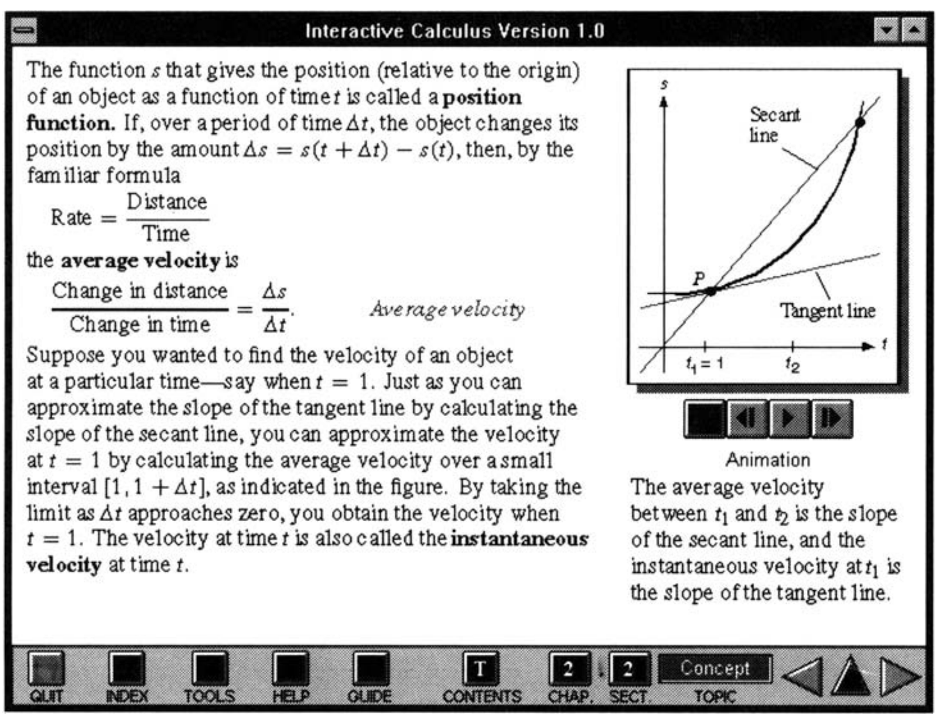


Figure 1 This animation contains a sequence of twelve frames that show a secant line's approach to a tangent line. The creation of the animation involved several different software programs, beginning with a program that generated the graphs. After the graphs were completed, other programs were used to annotate, digitize, and crop the frames. Finally, animation software was used to assemble the screens.

Figure 2 is the first screen of an animated dive. A sequence of eighteen frames shows the diver leaving the platform, rising, and then falling to the water. As with the animation shown in Figure 1, the dive can be played or viewed step-by-step. The exploration that accompanies the animation asks the user to analyze the dive visually, numerically, and analytically.

As appealing as they are, animations are only part of the brave new world of multimedia calculus. Simulations carry the concept of an animation one step further. The difference between the two is that an animation depicts the same motion each time it is played. With a simulation, the motion is dependent on user input.

For instance, the simulated motion of a baseball could depend on the initial speed and direction of the baseball and the speed and direction of the wind. Some simulations go one step further and introduce chaos into the simulation so the result is not entirely predictable.

Much has been written about the three-pronged approach to problem solving—graphical, numerical, and analytical. Simulations add a dynamic fourth approach to problem solving—the experimental approach. Consider the classic problem of finding the angle to project an object from the top of a cliff to travel a maximum horizontal distance. The analytic solution of this problem is surprisingly tedious, but a simulated solution is actually fun.

In addition to animations and simulations, a multimedia calculus textbook can also include video clips that transport the user into real-life settings such as rocket liftoffs, interviews with engineers and mathematicians, on-the-job construction sites, and tours of scientific laboratories or research centers.

Nonlinear Organization: A printed calculus textbook has a linear organization. Page 2 follows page 1, page 3 follows page

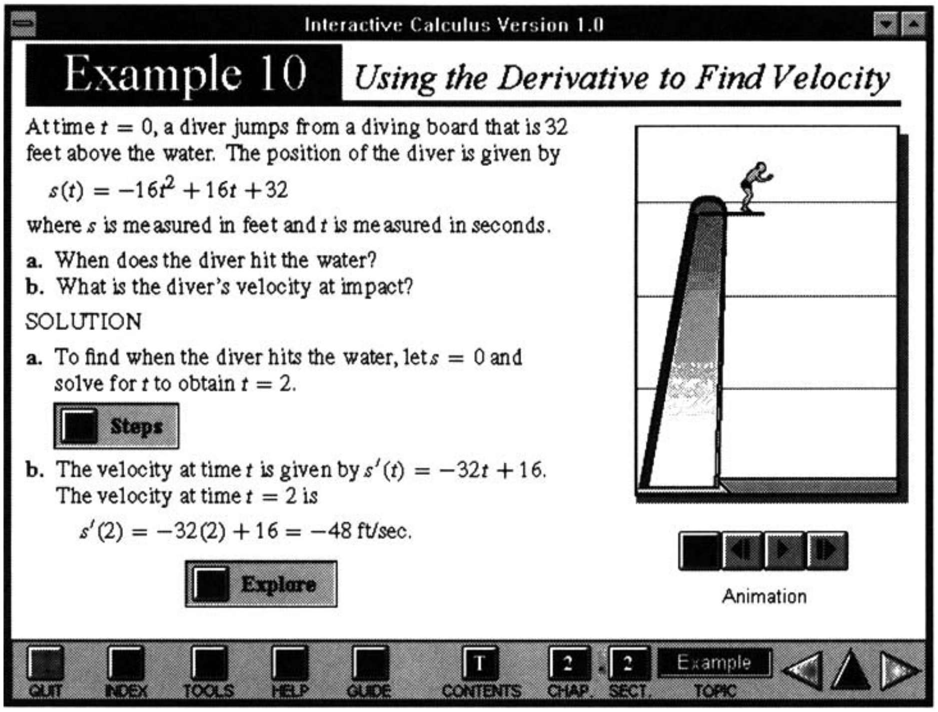


Figure 2 This animated dive contains a sequence of eighteen frames that show a diver leaving the platform, rising, and then falling to the water. As the diver moves through the air, the times are projected onto the animation screen. By viewing the animation step-by-step, the viewer can compare the times ($t = 0$, $t = 0.5$, $t = 1$, and so on) with the diver's heights. The exploration button asks the user to analyze the dive numerically, graphically, and analytically.

2, and so on. In practice, however, most students don't use textbooks linearly. Thus, the organization of a printed text doesn't conform to its use.

Of course, a CD-ROM calculus textbook could be organized linearly so that a user would be forced to move from one screen to the next. But the point is that the CD-ROM format doesn't require an author to use a linear organization.

By using a nonlinear (or hypertext) organization, an author can provide additional details, helps, examples, explorations, and excursions without cluttering the basic concepts of a section.

As an example, consider the opening section screen shown in Figure 3. A user who wants only a quick overview of the section can select the three "concept buttons." The main path through the three concepts of this particular section consists of only nine screens. While on this main path, students can take optional paths that provide proofs, additional remarks, or historical insights.

Instead of browsing through the quick overview, a user can approach the section along other paths. The "connections button" and "career interview button" provide real-life motivation for the concepts in the section. The "Explore it First" button provides a discovery mode for getting into the section's concepts. And, of course, for those users who want to jump right into the examples or exercises, those options are also possible.

All in all, the seventeen buttons of the opening screen lead to 171 different screens, some of which contain "live" mathematics that can be edited to provide an unlimited number of examples.

The advantage of this type of hypertext organization is that it easily adapts to a variety of uses. It provides quick tours for those who want a "lean" presentation, but it also provides options for those who want additional helps, historical insights, real-life applications, explorations, and so on. Thus, CD-ROM technology with hypertext programming is able to answer the decade-old call for a "lean *and* lively" calculus.

A nonlinear organization not only increases the versatility of a CD-ROM calculus textbook, it also helps solve an age-old dilemma with printed textbooks: the amount of explanation that is presented on a page. Every time an author adds more

*Please see **CD-ROM** on page 13*

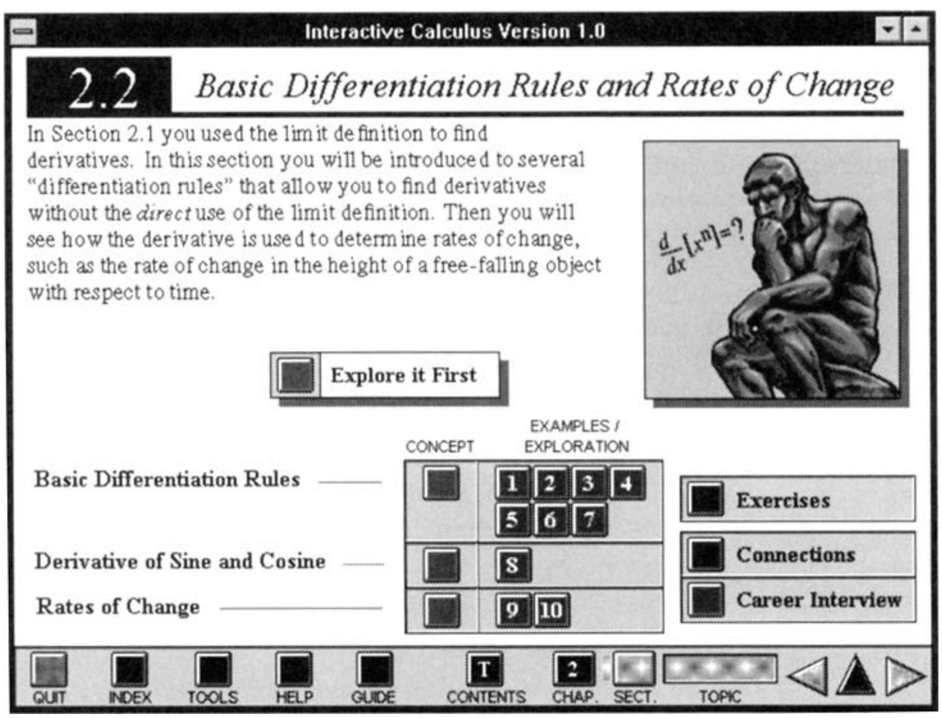


Figure 3 A nonlinear (or hypertext) organization is evident from this opening screen for a section. The 171 screens in the section cannot be traversed with a single linear path. Instead, users navigate through the screens as if they were moving along the branches of a tree. Users who want more help or details can move further out on the branches, while those who want quick tours or a general overview can stay close to the tree's trunk.

Open Secrets

Justin J. Price

Remarks on receiving the MAA's 1993 National Award for Distinguished Teaching, Cincinnati, Ohio, January 1994.

Here is what one student wrote on his evaluation of my teaching: "Since I stopped coming to your lectures, my grade has gone up from an F to a C." So before the MAA changes its mind, let me express my thanks for its recognition.

Pythagoras on the Porch

I owe my lifelong interest in teaching to my father who was an inspiring teacher. I remember, at age eight or nine, how my friends would come to the front porch of our house in Philadelphia on summer evenings because my father would teach us interesting things. I remember especially how he told us that certain configurations in the porch railing were called right triangles, that the slanted sides had a funny name—"hypotenuse"—and that a wonderful thing happens: the square of the hypotenuse always equals the sum of the squares of the legs.

From an early age, I looked forward to being a teacher myself. I wanted to experience that special thrill of seeing the light of understanding flash in students' eyes. I still do. For example, I enjoy teaching Fourier series to graduate engineers. I point out that expanding a function in a Fourier series is like expressing a very long vector in a large i, j, k coordinate system, and that the $a_n s$ and $b_n s$ they have been computing mechanically are just the components along the various orthogonal axes. Their reaction is usually, "Wow! That's great! Why didn't anyone ever tell us that?"

In order to give such insights and make mathematics more interesting and accessible, I have developed a number of teaching techniques. But when I began to prepare a talk about the "secrets of my success," I realized that my techniques are probably used by most concerned teachers, that my secrets are really open secrets.

Goose Bumps

If you forced me up against a wall and made me express in just one word the secret of teaching, I would say "enthusiasm." Enthusiasm makes mathematics lively and exciting. It conveys love for the subject and its beauty. So I will exclaim, "Wow! Euclid proved there are infinitely many primes, starting from practically nothing. Isn't that incredible? I get goose bumps every time I think about it," or, "Isn't it marvelous that you can evaluate certain hard definite integrals just by computing a residue?" Students need to see someone who is excited by mathematics. Unfortunately, many of our freshmen have never had that experience.

Positive Terms

Excitement produces a healthy attitude towards doing mathematics. Recently, I observed a TA showing a college algebra class how to solve the system

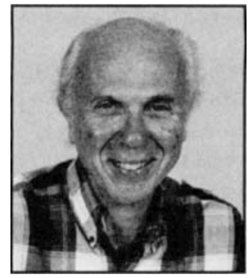
$$x^2 + y^2 = 9; y = x + b$$

He was concerned because they had not yet dealt with a parameter. But by saying, "I know this is very hard for you ..." and "I know the b makes the problem confusing ...," he created a negative effect. Later, I suggested a more positive approach, something like, "We are looking for the intersections, if any, of a circle and a line. That depends on the value of b, and we can't tell in advance what happens. But here is where math is so great! If we go ahead and solve, the math will tell us the answer!" As Mark Kac said, the best thing we can teach our students is to sit down and figure it out.

A corollary of enthusiasm is freshness. If I am bored teaching the same old stuff, the class quickly senses it. So I look for ways to keep the presentation fresh. One way is not to use my old notes. Even though I have taught calculus many times and at the end of each course have arranged the notes neatly in a folder and filed them in a cabinet, I never look at them again. I want the excitement of learning the subject along with the students.

Grandmothers and Advertising

Using down-to-earth language helps students learn. Once they are comfortable with a new concept, we can become more formal. For example, I paraphrase the comparison test for series of positive terms by "smaller than small is small; bigger than big is big." When freshman are struggling with functional notation, I tell them, "Take $f(x) = x^2$. Whatever appears in the window, you square it. I don't care if it's your grandmother, you square her." I call this my *Grandmother Principle*, and the students like it—except one who wrote on an evaluation, "Please leave my grandmother out of it."



Let me mention a few other teaching principles.

The Charades Principle. I'm a good charades player, although I'm a lousy actor. I just take some time to get my team tuned in on approximately the right wavelength. If asked to act out, say, *Titus Andronicus*, I would make some gestures indicating that it is a play, and a weighty play. Soon someone would suggest Shakespeare, and we would be nearly home. I use the same strategy in teaching. Before plunging in, I try to set the scene by explaining what we will be doing, why, and what methods we'll use. In fact, this approach applies to presentations at all levels. I remember a colloquium talk that started with the statement, "Consider the category of all co-groups." I slept through the rest.

The Wyatt Earp Principle. Wyatt Earp survived many a gunfight in the Old West. He didn't do anything fancy; he carried only one gun. But he took an extra split second to aim and got his man on the first shot. When students face a showdown at an exam, I urge them to take a minute and read the questions carefully. Otherwise—you know what happens—you pass out the test papers from the front, and by the time they reach the back, the first row has already erased a page and a half.

The Naked Observer Principle. Throw in something quirky every once in a while to stir things up. I like to remark that "to the untrained eye of the naked observer, it appears that...." Sometimes this flies right by, but ninety-nine times out of ten, someone catches on.

Truth in Advertising. A more serious principle. Sometimes we present an idea in one form, but without warning, apply it in different form. Take the Mean Value Theorem. It is usually stated as

$$[f(b) - f(a)]/(b - a) = f'(c)$$

but used in the form

$$f(b) - f(a) = f'(c)(b - a)$$

Mathematically, these are equivalent. But psychologically, to the untrained eye of your naked freshman, they may seem very different. The first is a curious fact about a tangent being parallel to some chord. Cute, but so what? The second form, however, provides an estimate for the way a function varies from one point to another, which is the basic concern of differential calculus. That's why the theorem is so useful. I think we should not slide over this important point.

We need Truth in Advertising also in the definition of linear independence. Many texts define a set of vectors $\{v_1, v_2, \ldots, v_n\}$ to be linearly independent if $c_1v_1 + c_2v_2 + \ldots + c_nv_n = 0$ implies $c_1 = c_2 \ldots c_n = 0$. For students wrestling with abstraction for the first time, that's hard. It is really a slick way of saying that the vectors are linearly independent if none of them can be expressed as a linear combination of the others. So why not define linear independence that way? That's what I do, but then I admit that given an explicit set of vectors, I don't want to sit around all weekend trying every combination. That's the advantage of the slick definition; it's not the one that naturally comes to mind, but it's more efficient.

Can Anyone Speak the Language?

So far, I have been discussing teaching methods that I am sure all serious teachers use. Now I'd like to mention one that is not so widely used: asking students to write mathematics. By "writing mathematics" I mean writing technical mathematics: equations, exponents, subscripts, and good mathematical exposition. I do not mean reports on the life of Gauss or essays on the role of statistics in today's world. Writing *about mathematics* is good; *writing mathematics* is better.

Unfortunately, many students have almost no facility in the language of mathematics although they have been exposed to it since eighth or ninth grade. Can you imagine someone who has taken four or five years of French yet cannot speak or write a simple sentence in French, or when travelling in France, is not even aware that one should speak French? A similar illiteracy in the language of mathematics is widespread, and we do very little about it.

Recently I asked a class of sophomores to derive and explain on paper the formula for the area of a sector of a circle. The results were appalling. I asked a class of future math teachers to define factoring. A typical response: "Factoring is when you break a number down into smaller numbers." No mention of the words "product" or "factor." I asked a class of juniors to express in mathematical notation a sequence that has period 4. Very few had any idea; subscripts are a total mystery. Such examples show that we are neglecting an important part of our students' education by not asking them to write. They need the ability to formulate definitions, state theorems correctly, use proper notation and vocabulary, and write out logical solutions to problems.

I became concerned about writing in the mid 70s when my department asked me to revive an unsuccessful course for math majors intending to teach high school. It seemed obvious that there are at least two necessary conditions for good teaching: you have to know something, and you must be able to communicate it. Since math courses generally ignore communication, I devised a course that is fairly modest in content but requires some serious writing. Each homework assignment includes three starred problems to be written up carefully, as if for a note in a journal. The writing is not to be directed to the instructor, but to a member of the class who has been sick and needs to learn the material. Above all, it must be reader friendly; the most important person involved in the homework is not the instructor or the student, but the reader.

This is a tall order. It means starting at the beginning, defining terms, using appropriate notation and vocabulary, proceeding logically, etc. To help my students with this kind of assignment, I distribute a set of guidelines which I require them to sleep with under their pillows. These guidelines include some very basic rules for civilized mathematics writing. For example, honor the equal sign. Do not write $n^2 = 16 = n = 4$ or say that an n-gon equals $(n - 2)180$ degrees. Write in sentences; $a + b$ is a fragment, not a sentence; $a + b = 15$ is a sentence. Where appropriate, use equations instead of English, but do not go to the other extreme and shun words entirely; keep the reader informed of what you are doing. Avoid pronouns as in "Differentiate it, then set it equal to zero and solve it." Rather, differentiate $f(x)$, set $f'(x) = 0$, and solve for x. Read over what you write. My guidelines were published in the *College Mathematics Journal*, November 1989.

Now, I don't want to make false claims of success, especially since I advocate truth in advertising. Writing is hard. Some students are so non-verbal, they never improve. The majority, however, show progress—not to the extent that I would like, but significant relative to their low starting levels. One claim I can truthfully make though: writing focuses students' attention. It makes them aware, often for the first time, that mathematics is very precise, that there is a difference between terms and factors, sequences and series, expressions and equations, that you don't multiply a number by 10 by "adding a zero."

Most important, writing makes students think. It forces them to reexamine what they know and sometimes realize that they don't know what they know.

Semi-Open

I am not the only one who thinks writing is important. Paul Halmos in the *College Mathematics Journal*, September 1993, says, "I write notes to myself, explicit ones with sentences .... I think by writing ... as if I were conducting a conversation between me and myself." Paul Davis's article "Some Glimpses of Mathematics in Industry" in *Notices of the AMS*, September 1993, explains what industry is looking for in our graduates, and asserts that "teaching communication skills—writing, speaking, listening—is essential."

Certainly writing is needed, but it is only one of many methods to help students learn. I have devoted a good bit of space in this essay to writing because it is a semi-open secret, less known than my open secrets.

Thank you for allowing me to share all of these ideas with you.

Justin J. Price is professor of mathematics at Purdue University.

Henry L. Alder

It is a great pleasure to feature on these pages the recipients of the 1994 Awards for Distinguished Teaching.

The Committee on Awards for Distinguished College or University Teaching of Mathematics is now in the process of nominating at most three of these distinguished teachers for the third annual national awards. The Board of Governors will act on these nominations at its meeting on August 14, 1994, in Minneapolis. The national awardees will be honored and will make presentations at the annual meeting in January 1995 in San Francisco.

At its meeting in Cincinnati, the committee was informed of the generous action of Past-President Deborah Tepper Haimo to endow the national teaching awards with annual contributions of $10,000 over the next five years. To recognize this act, the committee recommended to the Board of Governors that these awards be called the Deborah and Franklin Tepper Haimo Awards for Distinguished College or University Teaching of Mathematics.

This recommendation was approved by the Board of Governors.

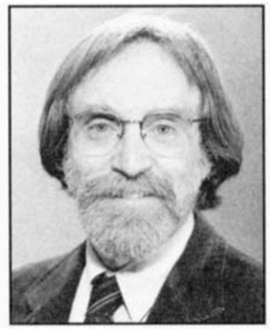
In addition, the committee approved the following resolution:

> The Committee on Awards for Distinguished College or University Teaching of Mathematics expresses its deepest appreciation to Professor Deborah Tepper Haimo for her generous donation to the MAA of an amount of $50,000 over the next five years to provide funding for the MAA's national awards for distinguished teaching. By this action she not only continues her commitment to foster excellence in teaching mathematics at the college and university level already so amply demonstrated by the central role she played as president of the MAA in establishing these awards, but also has taken a giant step in support of the current national efforts to elevate the teaching of mathematics to the highest level of excellence.

The 1995 national award recipients will be designated the first recipients of the Deborah and Franklin Tepper Haimo Awards for Distinguished College or Uni-

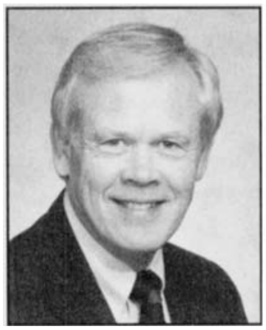
1994 SECTION AWARDEES

David M. Bressoud
Allegheny Mountain



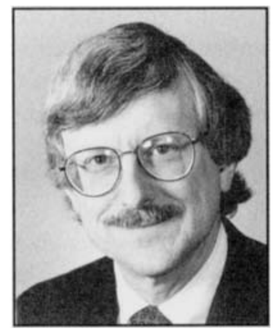
William Dunham
Eastern Pennsylvania and Delaware

James H. Wahab
Florida



Carroll Wells
Kentucky

David C. Lay
Maryland–DC–Virginia

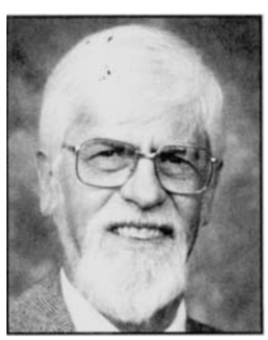


Jerrold W. Grossman
Michigan

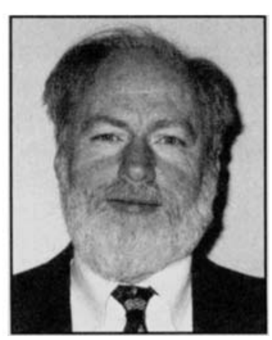
Mark Krusemeyer
North Central

Robert L. Devaney
Northeastern

Jane M. Day
Northern California



A. Duane Porter
Rocky Mountain



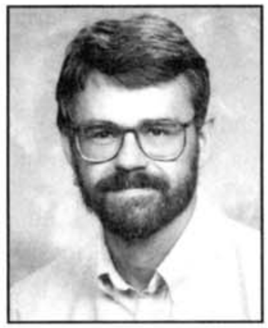
Stephen Hilbert
Seaway

John D. Neff
Southeastern

FOR DISTINGUISHED TEACHING


Ronald M. Shelton
Illinois


David S. Moore
Indiana


Lance L. Littlejohn
Intermountain


Curtis N. Cooper
Missouri


W. James Lewis
Nebraska

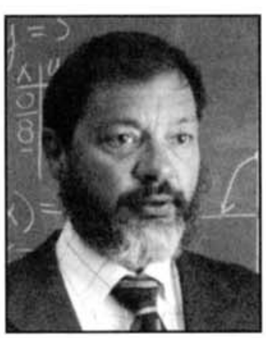

Richard Bronson
New Jersey


Robert S. Smith
Ohio


Lisa A. Mantini
Oklahoma–Arkansas


Mildred Jane Johnson
Pacific Northwest


Mario Martelli
Southern California


Steven M. Shew
Southwestern


Montie G. Monzingo
Texas

versity Teaching of Mathematics. The extraordinarily high quality of this year's section awardees will make their nomination a very difficult task. The committee wishes that it were possible for all members of the Association to read the folders on this year's Section awardees so that all could learn of the highly successful teaching skills used by these teachers.

The fact that 25 of the 29 sections have selected a section awardee speaks well for the fact that sections are supporting the national effort to identify and reward this nation's outstanding college teachers of mathematics. The sections' efforts in establishing procedures for nominating and selecting the award winning teachers deserve highest commendation.

On September 26, 1994, section secretaries will be sent information on the nominations for the fourth (1995) section awards. These guidelines will be essentially the same as those for the 1994 awards. The only change in the nomination form is one designed to simplify the requirements for documenting evidence of success in teaching by changing the second paragraph of page 2 of the nomination form to read as follows:

> You are also requested to submit no more than 3 pages of evidence to document the nominee's extraordinary teaching success. Appropriate documentation may vary greatly from institution to institution but may include summaries of peer or student evaluations of teaching, increases in numbers of mathematics majors or Ph.D. candidates, or student successes in mathematical competitions.

In addition, the letter asking section secretaries to solicit nominations for the fourth annual awards will include the following paragraph:


Martin Isaacs
Wisconsin

> Section selection committees are encouraged to designate some or all of those not chosen as a section award winner as candidates to be

*Please see **Awards** on page 15*

PERSONAL OPINION

Academic Advising as an Aggressive Activity

William Yslas Velez

No question about it, in the area of mathematics, Hispanics in this country are definitely underrepresented. We all know it, we are all concerned about it, and for the most part the mathematics community has been ineffectual in its efforts to increase participation of Hispanics in mathematics-based professions.

I certainly do not have a solution to this problem; however, I would like to detail some modest successes I have had in increasing the number of Hispanic students who chose career paths in science, engineering, and mathematics (SEM).

Though my own focus has been increasing opportunities for Hispanics in SEM fields, my comments really have little to do with this particular population. The methods and ideas I wish to present are applicable to the entire student population. It is worthwhile to point out that at present I have over 35 minority mathematics advisees, six of which graduated in May 94. I expect that during the next academic year, I will see even more of these minority students graduating with degrees in mathematics.

Six years ago, Clark Benson and I (at the time, Clark was a faculty member at the University of Arizona, but he is now at the National Security Agency) decided to contact all of the minority students who were enrolled in first semester calculus. [Throughout this report, "minority" means Hispanic, African-American, or Native American.] This was an easy task as there were fewer than 25 such students. Our contact with them would be as follows:

A) We met with each student individually, each week, for half an hour. During this time we went over their homework with them, went over copies of old exams that we had saved, and discussed their progress with them in the course.

B) Once a week in the evening we met with the whole group of students and discussed the topics that they were presently studying. In particular we stressed test-taking strategies.

Attendance was always a problem. Students would not show up for their individual sessions and would skip evening sessions. Nevertheless, I did learn something useful from this experience. Students benefit from personal attention and even good students perform better when they have information on which to base their decisions.

Clark Benson left for the National Security Agency after that first year, and I continued with the same pattern for the next year. The number of students increased and it was getting harder to get students to show up for their appointments and to come to the evening group session; however, I continued talking to students, encouraging them to continue with their mathematics and science courses. During advising sessions, I encouraged some to join the student chapter of The Society of Hispanic Professional Engineers, a group for which I had recently become faculty advisor.

I was getting tired of students not showing up for their appointments and not coming to the evening sessions. I found myself spending too many depressing hours trying to contact students by phone. The increase in the number of students, as well as my frustration, forced me to change the focus of my contacts with these students. In the third year of my efforts, I gave up the evening session since I could never get enough students to show up. I was also being swamped by the number of minority students who were enrolled in our calculus classes. In Fall 1991, we had over 200 minority students enrolled in the first two semesters of our calculus sequence. Clearly I could not meet with this many students on a regular basis.

I decided to meet with as many students as possible for short periods of time and to be more focused in my contacts with them. The following was the plan: I would meet with minority students who were taking first or second semester calculus and hire a student assistant to do the phone contacts for me. The assistant's responsibility was to call the students and set up appointments for me, then call back and remind the students of their appointments.

My first contact with the student would be before the semester began, hopefully at least a month prior to the start of the semester. The first thing I would do is ask what their majors would be. Secondly, I would go over their schedules with them for the coming semester. This proved to be a tremendous service. Students can make the oddest decisions as to the courses they plan to take. I am a firm believer that the average student should take a light load the first semester that he or she is on campus. The transition from high school to college, the change in the emphasis of the course material, the lack of concern of many of our faculty for our students, and the simple fact of recently acquiring freedom are factors that in many cases prove too much for students. Miserable grades during a student's first semester in college can have disastrous effects on his or her self-esteem, grade point average, and ability to obtain scholarships and summer internships.

Many of the students that I saw were first-year engineering majors. These students had already been to see their engineering academic advisors. The advice that they were given was to take calculus, chemistry, a course in computer programming, English, and possibly one other course. I don't think that more than ten percent of the students could successfully complete such a course of study. This proposed course of study is, in my opinion, elitist. Its effect is to convince the majority of students not to study engineering. Students who, with a little time, would make very good scientists and engineers, are turned away at the door to these careers before they have a chance to peek in.

My next topic of conversation with the student was to discuss the choice of major with them. At this stage in their careers, most students are not aware of the vast possibilities. Students have heard of engineers, so students who are good at mathematics and science usually choose this major. One common response to the question as to why they chose engineering is that they were always good at, or always liked mathematics, and engineering is where mathematics is studied.

This point in the conversation allowed me to talk about the mathematics major. At the University of Arizona, the mathematics major has many options—pure mathematics, applied mathematics, probability and statistics, computer science, economics and finance, education, and engineering mathematics. This flexibility makes the mathematics major attractive. More importantly, so many options lend emphasis to the significance of including mathematics in the student's course of study. This is a point that I stress. Mathematics is the key to opening the door to a universe hitherto unknown to the student.

Many of the students that I have spoken with do not have a clear idea as to what direction to take, and here again I stress the importance of the choice of calculus. While the student is unsure of his or her major, it is sensible to take calculus since this choice keeps open many career options.

I should point out that in these conversations with students, it is not my intention to turn them into mathematics majors, nor do I encourage them to switch their major to mathematics. My aim is to pass on to them the enthusiasm that I have for my chosen subject of study, to encourage them to pursue their own academic interests, and hopefully to include a good course of study in mathematics, whatever their chosen major will be. In fact, it happens regularly that one of my mathematics advisees will abandon the mathematics major for another major, one more to his or her liking. When this happens I consider my advising of them to have been a tremendous success. That student has left with a solid foundation of mathematics for a major that has caught his or her interest. In many cases the student has taken more mathematics than the typical student in that major, so that student will have an even better chance at success.

I strongly believe that the mathematics community has neglected our undergraduate mathematics majors. These students have chosen a very demanding field of study, and except for presenting them with lectures, we have provided them with little more. Even the information that would allow them to choose between mathematics and other fields is not given to these students.

One of our complaints in academe is that high school counselors give bad advice. We presumably give better advice; however, a recent incident makes me doubt our own desire to provide sound advice to our university students. At a recent mathematics meeting, I was talking with a group of mathematicians and I brought up my aggressive techniques, in particular, that I discourage minority students from choosing a teaching major early in their freshman or sophomore years. I was surprised by my colleagues' reactions and opposition. Essentially, they were opposed to my methods for three reasons.

1. They considered it unethical to impose my views on these students.

2. There is a great need for good high school mathematics teachers, and students should not be discouraged from this profession.

3. There is a tremendous need for high school minority mathematics teachers, and I should encourage these students to go into this profession.

This makes me wonder what it is that university professors are telling their students.

I find the last reason the most onerous. When I was an undergraduate I was encouraged to become a high school Spanish teacher (not mathematics because this was presumably too hard for Hispanics) because I could be a role model for the students.

Many students coming to my university simply do not know of the opportunities for someone with a mathematics background, and these students simply gravitate to the teaching profession because they do know of that profession. This is especially true of young Hispanic women. It is my responsibility to acquaint these students with the myriad possibilities that exist. Though the teaching profession can certainly be a very fulfilling occupation, I do not think that we should funnel our students into it until they themselves are aware of the opportunities that exist.

There are some problems with my technique as it applies to those students who choose mathematics as their major. Students should be encouraged to get advice from many faculty members. I have sometimes misread the abilities of a student and given poor advice. And what do we do with students who graduate with mathematics majors and decide to become high school teachers? Certainly, we would like to see these students teaching mathematics since they have taken a large number of mathematics courses, but these same students must now return and spend at least a year obtaining the credentials to teach in high school. We need quicker transition of these students into the high school classroom.

The other very real danger in advising is the way the subject matter is organized in mathematics. I have seen many students do quite well in the mathematics courses offered during the first two years—calculus, differential equations, and linear algebra. Then they hit a brick wall, encountering our junior and senior level courses in algebra and analysis. For many of these students, it's as if they have begun the study of a completely different subject. But it is worse than this when some of these students realize they are not good at "real" mathematics. What is a student to do? What advice can be given in these situations? Students have to be monitored very closely as they make the transition from lower to upper division studies.

I would like to close with some recommendations to the mathematics community.

1. View your undergraduate mathematics majors as an integral part of the department. There should be activities which undergraduates are essential for running. Computer laboratories are an especially attractive option.

2. Encourage funding agencies such as the National Science Foundation to provide funds to hire undergraduates for activities essential to mathematics departments. Just as the laboratory sciences have a need for undergraduates, so must mathematics departments develop such a need.

3. Advising undergraduate students should be a priority in our departments. If, as a community of scholars, we cannot convince our undergraduates of the usefulness of mathematics, then who else can? We should make an effort to contact every calculus student in order to provide necessary information for that student to understand the importance of mathematics in his or her curriculum.

4. Increase summer internship opportunities. There are many in the mathematics

community who would welcome the opportunity to work with undergraduates if there were funds available to support these activities. We must not forget the opportunities that industry offers. Be more aggressive in convincing industry to hire mathematics majors, as summer interns as well as permanent employees.

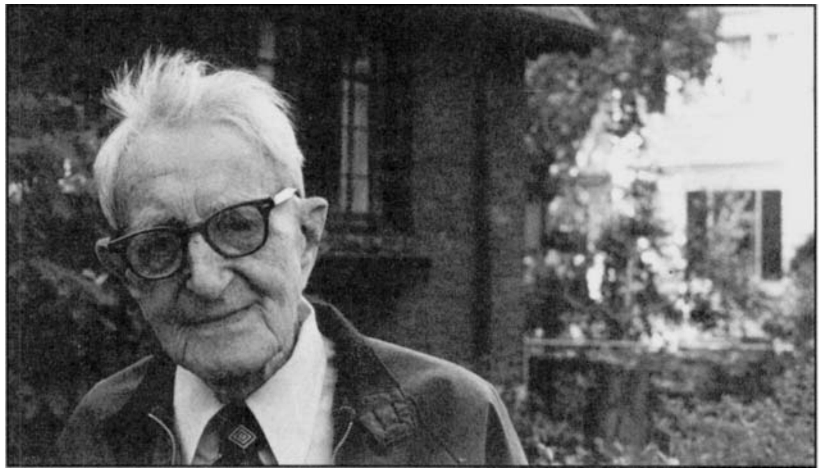
5. The transition from lower division to upper division is a harrowing one for many of our mathematics majors. One of the main reasons for this is that "proofs" are part of the mathematical scenery of these upper division courses and in fact form a major part of the course content. Yet "proofs" are being de-emphasized in our calculus sequence. What can we do to make this transition easier?

William Yslas Velez teaches at the University of Arizona.

Struik To Deliver His Centenary Lecture

On September 30, 1994, Professor Dirk J. Struik will deliver his centenary lecture "Mathematicians I Have Known," at Brown University. The event is co-sponsored by Brown University, Providence College, and the American Mathematical Society.

For information, call (401) 863-2708. For dinner reservations, send $25 by September 15th to Brown University–Struik Dinner, Box 1917, Brown University, Providence, RI 02912. The lecture begins at 3:30 P.M. in Brown University's List Auditorium.



AP Calculus Exams To Include Graphing Calculators

Anita Solow

Beginning in May 1995, students will be required to use graphing calculators on the Advanced Placement (AP) Calculus Examinations. The multiple choice section will be divided into two parts. Graphing calculators will be needed for some of the problems in the second part of the multiple choice section and on the free-response section. They will not be allowed on the first part of the multiple choice section.

The AP Calculus Development Committee is a committee of the College Board, consisting of three college faculty and three from high school. It has specified what the capabilities of the technology are to be for the test. Students will be expected to have a calculator to:

A. produce the graph of a function within an arbitrary viewing window;

B. find the zeros of a function;

C. compute the derivative of a function numerically;

D. compute definite integrals numerically.

Not all graphing calculators have these capabilities as built-in features, but all can easily be programmed to perform them. Students will be allowed to bring programmed calculators into the examinations; calculator memories will not be cleared. In this way, the differences among the calculators can be minimized.

The decision to require graphing calculators was arrived at after lengthy discussion and study. Important issues that were considered included the decision's acceptability to colleges and universities that grant AP credit and/or placement, equity issues surrounding calculator use, the cost of calculators, and the readiness of high school teachers to use graphing calculators. The main reason that graphing calculators are being required is the belief that the use of graphing calculators can make the calculus course a better course, with increased student activity and discovery-based learning.

The next step, revising the syllabi for AP Calculus courses, will begin this fall. In the past there was a large common core of material in most college calculus courses. This homogeneity made designing the AP Calculus course relatively easy. Today the situation has changed, and there are many different calculus courses taught throughout the country. Although there is still much common material in calculus courses, it is approached differently in many reform settings. This makes it more difficult to create the AP Calculus syllabi. In addition, integration of technology into the courses creates pressure to change the syllabi. Some topics that were part of a standard curriculum become obsolete with technology, while other topics gain importance. (Of course, there are differing opinions about what these topics are.)

Over 100,000 students take the AP Calculus examinations, with more than that taking the courses. One consequence is that a large number of students will be entering colleges and universities with facility in using graphing calculators in their mathematics courses.

The AP Calculus program is not static. It has changed in the past and will continue to do so in the future. What is perhaps different now is that the changes occur at a quicker pace.

CD-ROM from page 5

explanation or shows more steps, the page becomes denser and more foreboding. Thus, in a printed text, it is easy to lose sight of the forest because of the presence of so many trees.

As an example, consider the screen shown in Figure 4. This example asks the user to find and use the derivative of a function. By keeping the parent screen simple, the basic idea of the example remains prominent. The overall strategy—finding and evaluating the derivative—remains clear. The actual computation of finding the derivative by the limit process is of secondary concern and can be accessed by selecting the "steps button," as shown in Figure 5. Other observations about the derivative and the tangent line can be accessed by selecting the "explore button."

The alternative of presenting the entire example on a screen that can be scrolled is much less useful because it clouds the primary goal of the examples with many secondary mechanics.

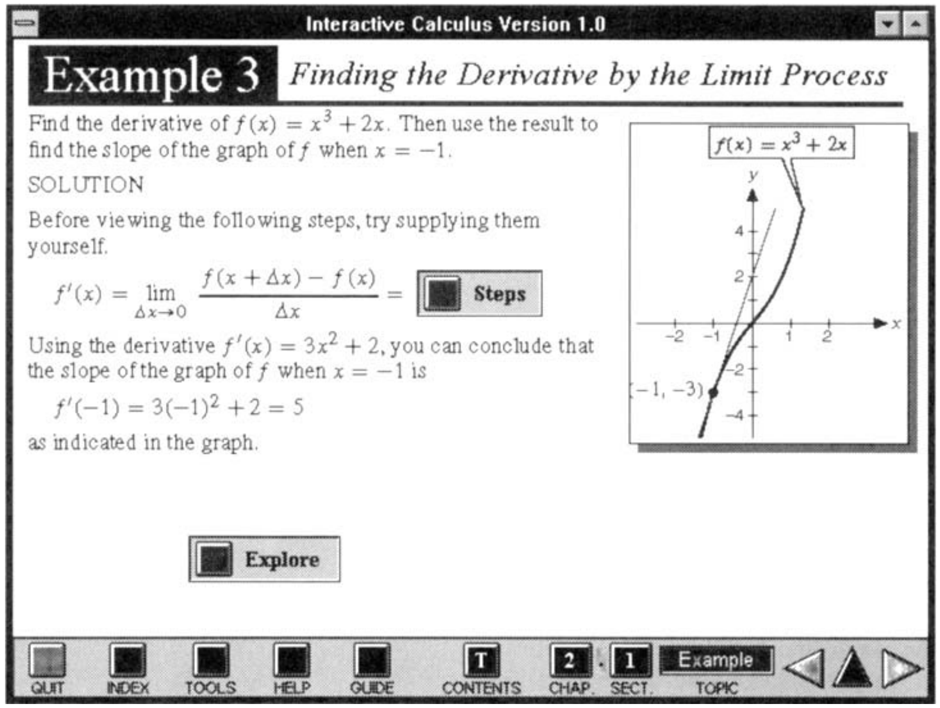


Figure 4 The problem of not being able to see the forest for the trees can be solved in a CD-ROM textbook by designing parent screens that present succinct overviews of essential concepts. From the parent screens, any number of child (or grandchild) screens can be accessed to provide further insight or clarification. For instance, the essence of the example in this screen is finding, evaluating, and interpreting a derivative. The mechanics of actually using the limit process to find the derivative, while necessary, would clutter the screen and make the example appear more complex than it is.

The Future: What does the future hold for textbooks and education? Although no one can answer this question completely, it seems clear that the benefits of CD-ROM textbooks will make their presence more and more common. With improvements in portable computers, one can imagine that CD-ROM textbooks will become commonplace. Already, publishers have begun making substantial investments in major CD-ROM textbooks. The first comprehensive CD-ROM textbook, *The Enduring Vision*—a United States history text by D. C. Heath—was introduced to the market in 1993. Many others are forthcoming, including the CD-ROM textbook mentioned in this article, which was developed by Meridian Creative Group.

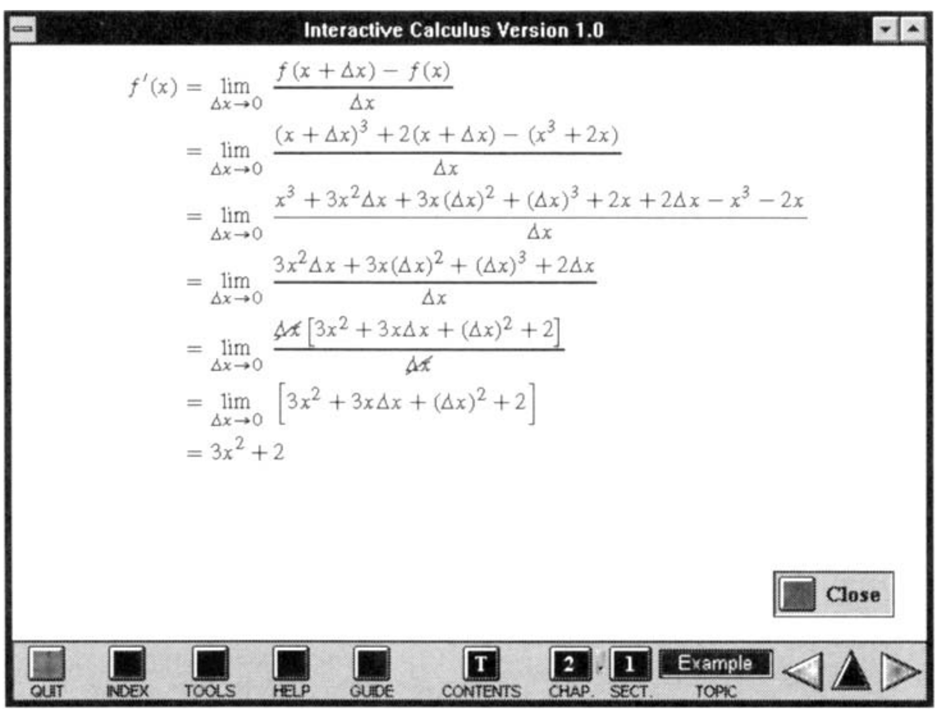


Figure 5 This is one of the child screens of the parent screen shown in Figure 4. By selecting the "steps button," a user is able to view a screen whose sole purpose is to show how the limit process can be used to find the derivative of $f(x) = x^3 + 2x$. After digesting this screen, the user can return to the parent screen and the essence of the example.

Roland E. Larson is a professor of mathematics at Penn State University at Erie. The fifth edition of his calculus text, Calculus, with D. C. Heath and Company, is available in printed and CD-ROM versions. The CD-ROM version was coauthored with Ann R. Kraus.

Rewards from page 3

In teaching departments, the report says, "These changes were recent enough to cause consternation among junior faculty members over exactly what was expected of them in order to gain tenure and whether these expectations were changing as they progressed toward tenure." In research departments, the new emphasis on teaching was "more evident in the rhetoric than in the actual policies, [but] this emphasis is definitely working its way into the rewards structure."

The report outlines a number of difficulties associated with making changes in the rewards structure. First, there is little consensus within the mathematical sciences community about how to evaluate many professorial duties. Research emerged as the activity that faculty are most comfortable about evaluating, but, the report says, "even this came under attack in some quarters. It was felt that a certain amount of publication, as well as invitations to conferences and giving colloquiums and seminars, could be achieved through cronyism." However, the report notes, whatever the problems are with evaluating research, they have not prevented research from gaining high importance in the rewards system.

With teaching, the situation is the opposite: perceived difficulties with evaluating teaching, the report states, "emerged as a fundamental stumbling block in efforts to increase the importance of teaching in the rewards structure." In particular, the student evaluation questionnaire—the single most frequently used method of evaluating teaching—was viewed with great suspicion. The report quotes one faculty member's assessment of what usually happens with student evaluation questionnaires: "If the student fails, I fail." When it comes to evaluating activities such as service to the institution or to the profession, "There was usually not even an attempt formally to measure effective work."

Another barrier to changing the rewards system is the uncertainty about what should be included under the rubric "scholarship". The report notes that this uncertainty is less pronounced in research-oriented departments, where scholarship is usually assumed to mean publishing traditional research articles in refereed journals. The committee's site visits revealed that most departments do not have a working definition of scholarship. Although there seems to be agreement that scholarship implies some sort of active engagement with the discipline, there are varying views on exactly what kinds of activities should be considered scholarship and how they should be rewarded.

Lack of communication between various organizational levels is a major problem at many institutions, the report notes, and one that can hamper efforts to change the rewards system. Often there is a lack of understanding about the relative values that institutions placed on teaching, research, and service. "One assistant professor told us that teaching was absolutely the main consideration in the tenure decision," the report says, "while another in the same department told us the main consideration was research." There are often disparities in goals: "In some places it was apparent that the department and the administration were working on totally different agendas, and neither knew what the other's was."

The fewest communication problems were found in institutions with the most effective department chairs, the report says. Acting as the interface between the department and higher administration, chairs can have a great deal of influence over the well-being of the department. "Unfortunately," the report notes, "chairs commonly have no systematic training to prepare them for this role." An interesting finding about chairs emerged from the survey. Faculty and chairs were asked whether salaries reflect differences between excellent and average teaching. In every type of institution, the percentage of chairs who answered "yes" was close to double that of the faculty.

What kinds of rewards do faculty want? The report states that, when it comes to salary raises, most faculty prefer a rewards system that combines across-the-board and merit salary increases. In addition, the report says that the general "quality of life" in the department emerged as a reward much valued by faculty. Quality of life rewards can take many forms, tangible and intangible: offices, classrooms, parking, clerical help, computer facilities, congeniality within the department, good communication with the administration, and appreciation from colleagues and the chair. "The most common reason for low quality of life in departments was lack of appreciation of the department by the administration," the report states.

Recommendation and Guiding Principles

Because of the great diversity of institutions and departments, the report avoids making pronouncements about what departments should do. However, it does state one general recommendation: "The recognition and rewards system in mathematical sciences departments must encompass the full array of faculty activity required to fulfill departmental and institutional missions." In addition, the report sets forth six Guiding Principles to assist mathematical sciences departments in considering changes in their rewards systems.

Three of the Guiding Principles have to do with what kinds of activities should be rewarded. The report points to research as the fundamental *raison d'être* of the discipline and states that research should be among the primary factors of importance in any rewards system. There must be internal strength in core areas of the discipline as well as "lively connections to other disciplines and to business and industry," the report states. In addition, "No distinction should be made in the rewards system between research in the core areas of mathematics and that in applied areas." The report suggests that joint appointments, with joint evaluations, can help interdisciplinary research to thrive.

Two other primary factors of importance in any rewards system are education and service. Although there may be more or less emphasis on research depending upon the department and the institution, teaching is a major responsibility in every department. Therefore, the report states that, in all departments, "the teaching function should be viewed as a primary responsibility of all faculty and should be rewarded and recognized accordingly." Departments should help faculty and graduate students improve their teaching by having those acknowledged to be excellent teachers share their expertise or by calling upon such campus resources as teaching centers.

In the realm of service, the report points to a variety of activities that are crucial to departments and their institutions and which should be valued as important components of a rewards system. These include: chairing the department, managing the undergraduate or graduate programs, serving on departmental or institutional committees, recruiting and mentoring minority and women students and scholars, and assuming leadership roles in professional organizations.

Scholarship should also be an important factor in any rewards system. The report suggests that every faculty member should be engaged in some form of scholarship. In some departments traditional research may be the primary mode of scholarship, while in others it might be more appropriate to adopt a broader definition of scholarship that encompasses such activities as writing textbooks and expository papers, public awareness efforts, curricular development, improving teaching methods, and research in mathematics education. The report also suggests that rewards systems be flexible enough to allow faculty to shift to different forms of scholarship during their careers. Noting that no one definition of scholarship will be right for every institution, the report includes in an appendix a proposal for a definition of scholarship that could be used as a platform for further discussion and refinement within individual departments and institutions.

For a rewards system to work, there must be accepted methods for evaluating various activities. In particular, the report notes that the lack of such methods can prevent some professorial activities from being properly rewarded. For example, the report says, "The perceived inability to evaluate teaching is one of the major stumbling blocks to making teaching an integral part of the rewards system in mathematical sciences departments." The report states that departments should not allow imperfections in evaluation methods to impede progress in broadening the rewards structure. National leadership on the issue of evaluation would help, the report says, proposing that the professional societies could assess evaluation methods currently in use and provide guidelines, models, or suggestions.

Mathematical sciences departments have a wide array of responsibilities connected to research, to students, to their institutions, to the profession, and, depending upon the department and the institution, to the local community and the nation. "The optimal strategy for meeting these varied departmental responsibilities is not to expect all faculty members in the department to do all things at all times," the report notes, "but rather to match faculty work with faculty interests.... But, in order to work, this approach must be accompanied by a rewards system that recognizes excellent contributions to all facets of the departmental mission." In addition, a hallmark of academia is that not everyone need fit into the same mold. "[R]ather than codifying every aspect of a rewards system," the report declares, "departments should formulate clear and flexible policies."

The rewards system should be consonant with the departmental mission and the mission of the institution, the report states. Departments must examine whether the needs of their constituencies are being met and must make the rewards structure responsive to those needs. In addition, clear lines of communication are important. All concerned—faculty, chair, and administration—should know and understand what is valued and rewarded. The report particularly stresses the importance of the department chair in the implementation of any rewards system. "Care in the selection and training of the chair is an important factor in the health and well-being of the department," the report states, suggesting that the mathematical sciences community should organize more workshops for chairs and other training and development mechanisms.

Distribution

Those wishing copies of the report should write to the American Mathematical Society, 1527 Eighteenth Street NW, Washington DC 20036; e-mail: amsdc@ math.ams.org. The report (without accompanying figures) is also available on e-MATH. To access e-MATH, type: telnet e-math.ams.org. The login and password are e-math. For more information, send e-mail to support@e-math. ams.org.

Allyn Jackson is Associate Managing Editor, Notices of the American Mathematical Society.

***Awards** from page 9*

renominated the following year. For those so designated, a letter should be written to the nominator asking him or her whether the nominator is willing to renominate the candidate, whether he or she is still eligible, and, if so, to update the file if necessary, but not requiring a new file to be submitted.

Last year, some sections had been concerned that, while the candidates who were nominated were outstanding, the number of nominations had been smaller than they would have liked. This year, it appears this has been much less of a problem, perhaps as a result of the publicity given last year to the example set by the Northeastern Section which sent out a flyer in March urging any member of the section to "send a one-page letter in support of an outstanding teacher and the Section Committee will ask the candidate's department chair to complete the nomination form." To assist further the effort to obtain more nominations, the committee this year encourages anyone, in particular its own members, to call department chairs and others to urge them to make nominations.

The committee hopes that the above indicated simplification of the requirements for documenting evidence of success in teaching and the suggested procedure for renominations the following year will make it easier for chairs to nominate deserving candidates. The national committee urges all members of the Association to think of worthy candidates for these awards and nominate them to the appropriate section committee. Even if your candidate should not be selected as a recipient of the award, remember that a nomination by itself is a distinct honor and also that there is now a simple procedure in place allowing the candidate to be nominated again if not selected the first time. The larger the pool of outstanding nominations, the easier it will be to maintain the high quality of the awards, so successfully established by the first three sets of awardees.

Henry Alder is chair of the Committee on Awards for Distinguished College or University Teaching of Mathematics.

NETWORKS IN FOCUS

Navigating the Network with NCSA Mosaic

Frank M. Baker

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As he was leaving for a meeting in Asheville, John remembered reading somewhere that the North Carolina Department of Transportation had announced plans to rebuild and extend parts of I-26. John barely had enough time as it was; if much of that stretch of road was currently under construction, he would need to call and say he would be late. Going to his desktop computer, John used NCSA Mosaic, a new Internet interface, to find the North Carolina Department of Transportation highway construction projects map and was happy to see that the plans affected only one short section of the highway south of Asheville. John selected "I-26 improvements south of Asheville" and read the project plan. Aside from the work on one bridge, all the lane closings would be at night; he should still be on time.

The past several months have seen unprecedented coverage of the Internet in the popular press. Until now, though, navigating the network has been an exercise in frustration for even the most ambitious networker. Now a new software program promises to make Internet access easy and transparent for the everyday user.

NCSA Mosaic, developed by the Software Development Group at the National Center for Supercomputing Applications, is a window on the ever-expanding world of on-line information. As a distributed *hypermedia browser* designed for information discovery and retrieval, NCSA Mosaic provides a unified interface to the diverse protocols, data formats, and information archives used on the Internet.

With NCSA Mosaic's hypermedia-based interface, electronic links known as *hyperlinks* are embedded in richly formatted documents that can include full-color images and sounds. NCSA Mosaic presents these documents like the pages of an interactive, scrollable, online book. You can move around within complex documents, as well as from document to document across the network, simply by clicking on these hyperlinks. You use the same interface for navigation and for document viewing; you can even retrieve information from Gopher, WAIS, and anonymous FTP servers without moving to a different application for each one.

NCSA Mosaic and the WorldWide Web

The Internet has grown up during the past two decades as a loosely federated worldwide collection of information resources and services. NCSA Mosaic itself is part of the WorldWide Web environment, a system for maintaining distributed hypertext that originated at the European Laboratory for Particle Physics, CERN, in Geneva, Switzerland. Initially developed to keep track of researchers' information and to provide an easy method of sharing information among scientists, the Web has grown into one of the world's most widely used tools for information publishing, discovery, and retrieval.

The Web employs several established or developing standards to make it as universally usable and reliable as possible. It uses a standard naming convention—known as the Uniform Resource Locator or URL—to locate individual pieces of information sitting on machines anywhere across the network. Clients and servers use a standard transfer protocol—known as the HyperText Transfer Protocol, or HTTP—to send and retrieve documents across the Web. Documents on Web servers are formatted with a standard markup language known as the HyperText Markup Language or HTML. The HTML specification includes the hyperlink format that allows users to move around the Internet by jumping from one document to another.

Building on the Web's initial structures, NCSA Mosaic uses a client/server model for information distribution. A server sits on a machine at an Internet site answering queries sent by NCSA Mosaic clients, which may be located anywhere on the Internet. To users, the client looks like any other application on their machine, only this one has immediate access to information all over the world. The pieces of information sent from servers to clients are known simply as documents, which may contain plain text, formatted text, graphics, sound, and other multimedia data.

An Integrated System

The NCSA Mosaic system is an integrated set of browsers, viewers, servers, gateways, and filters that allow you to approach the Internet as one consistent information source. At the simplest level, the NCSA Mosaic clients provide navigation and document viewing capabilities for browsing the information universe of the Internet. As your interest, needs, and skills develop, the configurable addition of external viewers allows easy and straight-forward expansion to handle virtually any specific type of data. This flexibility will allow you and NCSA Mosaic to keep pace with the quickly evolving world of multimedia and allows NCSA Mosaic to be custom configured for any working environment.

The NCSA Mosaic system is a completely open framework; you can enter at your most comfortable level, progress through the use of various viewers, learn to create your own hypertext documents, set up your own server, engage in multimedia collaboration with colleagues in distant locales, develop scripts for specialized information filtering and presentation, and develop gateways to unique information resources and integrate them into the NCSA Mosaic information space for other users. In short, the possibilities are endless; you can think of NCSA Mosaic and the Web as allowing the progressive customization of your own information space, and that of your group.

External Viewers

There are myriad types of data available on the Internet, many of which must be stored, read, and interpreted in a unique manner. Though NCSA Mosaic is not designed to read and interact directly with all of them, the system relies on external viewers in order to work with the widest possible variety of image, audio, video, and typeset data formats. These external viewers are separate programs that are invoked when necessary to display certain types of data.

With the external viewers, users are not limited by the NCSA Mosaic (anyone can use any viewer that will work with NCSA Mosaic to view any type of data). Plus, as new viewers and data types appear, they can be easily integrated into the NCSA Mosaic environment without rewriting the application software. For example, the various NCSA Mosaic clients can use the following external viewers:

lview *for the Microsoft Windows client* a Windows utility that plays GIF, JPEG, and TIFF images, as well as images recorded in several other formats

Ulaw *for the Macintosh client* a Macintosh utility that plays audio data

xv *for the X Window System client* an X utility that displays GIF, JPEG, and TIFF images as well as images recorded in several other formats.

These are just a sample of the available viewers. NCSA makes several standard viewers available, but the system can be configured to accommodate other viewers.

Setting Up the Client

NCSA Mosaic is implemented for three types of platforms:

X Window System

Macintosh

Microsoft Windows.

Each implementation takes advantage of the strengths of its respective platform, but they have all been implemented to preserve as much cross-system compatibility as possible. All three clients can be downloaded for personal use from NCSA's anonymous FTP server. (See Downloading Clients from the NCSA FTP Server.)

Installing and running an NCSA Mosaic binary is straightforward. The procedures differ slightly across the X, Macintosh, and MS Windows platforms, but they are installed like any other application on their respective platforms. The installation procedures are fully described in the readme files referred to in "Downloading Clients from the NCSA FTP Server" and in documentation that can be found once the files have been downloaded and uncompressed.

To use NCSA Mosaic as an Internet browser, the system on which it is installed must be fully connected to the Internet. This is because the first thing NCSA Mosaic usually does when you run it is download one of the NCSA Mosaic home pages (the start-up document) from an NCSA server. If NCSA Mosaic executes but you get an error message instead of a home page, the problem is most likely in your Internet connection; you will have to get that connection established before you can use NCSA Mosaic to navigate the Internet. NCSA Mosaic can also be used as a collaborative tool within a working group without an Internet connection, but such applications are beyond the scope of this article.

Where Can I Go From Here?

Once you have successfully installed NCSA Mosaic, you should spend some time becoming familiar with the interface. The NCSA Mosaic Demo Document, available via a hyperlink in the NCSA Mosaic Home Page or via a menu selection, provides an overview of NCSA Mosaic's capabilities with hyperlinks to a wide variety of information sources. As you browse the information universe, you can access material through other menu selections and other home pages.

Serving Information

To distribute information via the WorldWide Web, you will want to set up an HTTP server. The HTTP protocol is stateless, lightweight, and extremely fast, but provides capabilities not found in earlier protocols, such as FTP. HTTP servers are currently available from various Web sources for UNIX, Macintosh, and Microsoft Windows systems.

If you wish to publish hypertext documents, you should first learn about HTML—the formatting standard for hypermedia documents in the Web environment—and URLs—the scheme for consistently naming documents accessible on the Web. You will find hyperlinks to HTML and URL primers at the very end of the NCSA Mosaic Demo Document mentioned earlier. Those primers in turn point to more advanced information sources.

Current Release Levels

In November and December 1993, NCSA released the following versions of NCSA Mosaic:

NCSA Mosaic for the X Window System Version 2.0

This version can be used on almost any modern UNIX-based graphics workstation (e.g., Sun Sparc, IBM RS/6000, DEC 5000 or Alpha, Silicon Graphics IRIS).

NCSA Mosaic for the Macintosh Version 1.0.2

This version can be run on any Macintosh, including SEs and Classics, running System 7.0 or higher.

NCSA Mosaic for Microsoft Windows Version 1.0

This version can be used on any Intel 80386SX-based PC (or better) running Microsoft Windows release 3.1 or later. This client will run with 4 Mb, but NCSA recommends a minimum of 8 Mb of RAM.

NCSA Mosaic is being continually developed. The most up-to-date versions can be accessed by checking NCSA's FTP server.

E-mail queries concerning these releases can be sent to the following addresses:

Macintosh mosaic-mac@ncsa.uiuc.edu

Windows mosaic-win@ncsa.uiuc.edu

X mosaic-x@ncsa.uiuc.edu

Downloading Clients from the NCSA FTP Server

NCSA Mosaic can be acquired from NCSA's anonymous FTP server. You must first execute the following FTP command:

ftp ftp.ncsa.uiuc.edu

Enter anonymous at the login prompt and

press Return. Enter your e-mail address (e.g., jdoe@business.com) at the password prompt.

If you have never downloaded files from this server, download and read the file README.FIRST.

You will find NCSA Mosaic executables in the following directories. Initial installation instructions can be found by reading the indicated readme file for each client:

Macintosh executable /Mosaic/Mac/

Macintosh readme /Mosaic/Mac/ NCSAMosaic.1.0.2.README

Windows executable /Mosaic/Windows/

Windows readme /Mosaic/Windows/ readme.now

X executable /Mosaic/Mosaic-binaries/

X readme /Mosaic/README.Mosaic

Please note that these clients are copyrighted but free for noncommercial use; NCSA and the University of Illinois retain the copyright but will allow anyone retrieving the software from the FTP server to use it personally without any further license. Anyone who wishes to use or distribute the software commercially must first obtain a license. The full NCSA Mosaic copyright notice can be viewed online with any NCSA Mosaic client.

Setting Up a Server

NCSA has developed a freely available HTTP server for UNIX platforms. It is available from NCSA's FTP server in the directory /Mosaic/ncsa_httpd. Full configuration instructions are provided with each of the binary and source distributions available there. Send e-mail to the following address if you have any questions or problems: httpd@ncsa.uiuc.edu.

For More Information

The best way to get more information on NCSA Mosaic, the WorldWide Web, the Internet, and related technologies is to get online and start browsing. The online information is extensive and constantly updated.

If you are looking for information on the Internet, *The Whole Internet User's Guide and Catalog*, by Ed Krol of the University of Illinois, is an excellent source. This book is published by O'Reilly and Associates.

Uniform Resource Locator

The Uniform Resource Locator (URL) is the standard addressing mechanism used to locate and retrieve documents from anywhere on the WorldWide Web. A URL consists of three parts: a code identifying the transfer protocol to be used, an address identifying the machine on which the file resides, and a full pathname locating the file on that machine.

For example, the Home Page for NCSA Mosaic for the Macintosh is in the HTML file /SDG/Software/MacMosaic/MacMosaicHome.html on NCSA's WorldWide Web server. When it starts up, NCSA Mosaic for the Macintosh usually retrieves this document automatically using the following URL:

http://www.ncsa.uiuc.edu/SDG/Software/MacMosaic/MacMosaicHome.html

Code for the HTTP protocol — NCSA's Web server — The pathname of the file containing the document

NCSA Mosaic and HTML shield users from URLs most of the time. The URL is embedded in the HTML document source code that generates a highlighted hyperlink. When a user views a document and selects a hyperlink, NCSA Mosaic uses the URL in the source file to automatically retrieve the indicated document.

HyperText Markup Language

Documents designed to be read on the WorldWide Web are usually formatted with the HyperText Markup Language (HTML). HTML provides the ability to print formatted lists, titles and subheadings, inline images, bold and italic text, hyperlinks, and more. It also provides the ability to point to images that can be viewed through an external viewer, audio files, or movies that can be played if a user has the appropriate software and hardware installed.

The first section below is a simple HTML selection that illustrates the title, level-one heading, emphasized text, and paragraph commands. The formatted output appears at the bottom.

<TITLE>Introduction to HTML</TITLE>

This is the first paragraph of a <EM>very</EM> simple HTML document.<P>

<H1>Level One Heading</H1>

HTML is a straightforward markup language with formatting commands enclosed in angle brackets.<P>

HTML has many additional capabilities, including hyperlinks and references to inline and external images, that are not illustrated here.<P>

INTRODUCTION TO HTML

This is the first paragraph of a *very* simple HTML document.

Level One Heading

HTML is a straightforward markup language with formatting commands enclosed in angle brackets.

HTML has many additional capabilities, including hyperlinks and references to inline and external images, that are not illustrated here.

See the HTML Primer, available online through NCSA Mosaic, for a more thorough introduction to HTML.

Frank Baker is a technical writer with the NCSA Software Development Group. NCSA, the National Center for Supercomputing Applications, located on the campus of the University of Illinois at Urbana-Champaign and is funded in part by the National Science Foundation. Several members of the NCSA Mosaic development team contributed to this article.

Interactive Mathematics Text Project Chooses Second Round of Developers

The MAA's Interactive Mathematics Text Project has announced the selection of eight interactive text developers. The developers were selected from the 138 participants in the IMTP workshops held during the summer of 1993. Each developer will receive an IBM Pentium computer, printer, and software to be used in the creation of an interactive text. In addition, each developer will be supported to attend an IMTP advanced workshop during the summer of 1994 and the IMTP Developers' Conference to be held in October at the Institute for Academic Technology at the University of North Carolina at Chapel Hill.

The individuals chosen, the topic of their proposed text, and the software platform they are using follows:

Charles Hofmann
LaSalle University
and
Roseanne Hofmann
Montgomery County Community College
Precalculus and Calculus
MathKit for Windows

Caren Diefenderfer
Hollins College
Differential Equations
Maple

William Slough
Eastern Illinois University
A Brief Calculus for Non-science Students
Maple

Margie Hale
Stetson University
Differential Equations with Modeling
MathKit for Windows

Ken Davis
Albion College
Discrete Mathematics
Mathematica

Kyle Siegrist
University of Alabama–Huntsville
Probability
MathKit for Windows

William Mueller
University of Arizona
(currently at Northern Michigan University)
Mathematical Modeling
Mathcad

William McClung
Nebraska Wesleyan University
Number Theory
Mathematica

The Interactive Mathematics Text Project has as its goal the improvement of mathematics learning through the use of computer based interactive texts. The project is supported by the IBM Corporation, The National Science Foundation, Waterloo Maple, Wolfram Research, MathSoft, and Eduquest. Twelve IMTP workshops are scheduled for the summer of 1994. More information is available through the gopher imtp.math.upenn.edu or by contacting the project director, Gerald J. Porter, at gjporter@math.upenn.edu.

Conference Honors Stavros Busenberg

An international conference on differential equations and applications to biology and to industry was held in Claremont, California, June 1–4, 1994, to honor the memory of Stavros Busenberg, professor of mathematics at Harvey Mudd College and active member of the applied mathematics community. He succumbed to ALS (Lou Gehrig's disease) on April 3, 1993 at the age of 51. The conference was attended by more than 150 friends of Stavros from at least 24 countries, representing every continent of the world.

The conference began with a memorial lecture consisting of reminiscences and descriptions of Stavros' contributions in various pure and applied mathematical areas, including remarks by Ken Cooke, Ellis Cumberbatch, Mimmo Ianelli, Mario Martelli, and Horst Thieme.

Hour-long addresses given by Avner Friedman, Karl Hadeler, Jack Hale, Mimmo Ianelli, Simon Levin, John Ockendon, and Pauline van den Driessche were interspersed with 90 half-hour presentations and two poster sessions. The program also included a piano recital by Valeria Profeta Romano and a memorial banquet where friends and family shared reminiscences about a sorely missed colleague, friend, husband, and father.

Several volumes of articles, including a memorial volume to be published by the journal *Mathematical Biosciences*, are being prepared. Funds to endow a scholarship to support travel to meetings by young investigators are being raised. The Stavros Busenberg scholarship will be administered by the Society for Mathematical Biology.

Focus on the MAA Gopher

V. Frederick Rickey

go•pher+ n. 1. A hardy short-tailed burrowing mammal of the family Geomyidae of North America. 2. (Amer. Colloq.) Native of Minnesota, the gopher state, in full winter regalia. 3. (Amer. Colloq.) One who runs errands, does odd-jobs, fetches and delivers documents, or is required to "go for" tools, supplies, equipment, etc. for a higher-up. 4. (Computer tech.) Software following a simple protocol for burrowing through a TXP/IP internet, made more powerful by simple enhancements.

That's what the MAA has up and running (definition 4, please).

Gopher software, which is an easy to use tool for distributing information across the Internet, comes in two versions. A gopher server is the part of the software that serves out information to all that request it. This is what the MAA has installed and is constantly adding new information to. To access this information, you need the other portion of the software package, a gopher client. It must be installed on a machine that you can access that is on the Internet.

Since the gopher software was developed at the University of Minnesota in April 1991, some 1700 gopher servers have been set up around the world. Hundreds of thousands of gopher clients are in use. To see if your Internet connection has one, type the word "gopher" at the system prompt. If the software is there, you are off and running in gopherspace. If nothing happens, talk to a computer guru at your place and get it installed (it is available free via anonymous FTP at

boombox.micro.umn.edu

in the directory pub/gopher and there are versions for just about any computer system you may have). A stopgap option is to telnet to one of the publically available gopher clients, say

consultant.micro.umn.edu

Use "gopher" to log in. If your machine has a gopher client then you can access the MAA Gopher directly by typing

gopher gopher.maa.org

at your system prompt. Otherwise you will find it listed among "All the gopher servers in the world."

Describing how to use a gopher is harder than doing it. You will be presented a menu and you can make choices by typing the number of your choice followed by "enter" or by using the arrow keys and then "enter." Then you will be presented with a sub-menu or a document to read. Type "u" to move up in the tree (well, its trying to be a tree) and "q" to quit.

For example when you access the MAA Gopher, you will be presented with the screen of options in the box below.

Hopefully these choices are self explanatory and give you some hint of what information is available. On the MAA Gopher, you will find information about the organization and its committees, a list of the staff members and their e-mail addresses, information about the books and journals the MAA publishes and how to order them, information about innovative mathematics programs (the Celebrating Progress database), career information for students, information about SUMMA, and information about meetings. In addition you are led to connections with many mathematics related gophers and e-mail groups. Before long, you will find yourself moving seamlessly from one gopher site to another — that is the magic of the system. Enjoy.

Send News and Suggestions

Your suggestions on how the MAA Gopher can be improved are most welcome. They will be considered carefully and implemented when possible. The aim of the MAA Gopher is to provide as much information as we can about collegiate level mathematics.

Items for posting on the gopher are especially welcome. If you are planning a meeting that will be of interest to members of the Association, let us know about it as soon as possible. As you get more information about speakers, accommodations, etc., send that along and the posting will be updated.

We encourage every student chapter and every Section of the MAA to send information about their activities. If you have an interesting program that you would like to share with the mathematical community, please send a description.

All suggestions, complaints, corrections, questions, and contributions should be sent via e-mail to rickey@maa.org

You will receive a response.

V. Frederick Rickey was MAA visiting mathematician during the 1993-94 academic year.

Mathematical Association of America

--> 1. About the MAA Gopher Server.
2. About the MAA organization and its activities/
3. Celebrating progress in collegiate mathematics
4. Committees and governance of the MAA/
5. Electronic services of other mathematical organizations/
6. General information of interest to mathematicians/
7. Meetings calendar/
8. Publications of the MAA/
9. Sections of the MAA and their activities/
10. Student information and activities/
11. Women and Minorities/
12. Suggestion Box.

In Memoriam

Robert Abernathy, professor at South Carolina State College, died on July 19, 1993. He was an MAA member for 35 years.

Bruce A. Anderson, professor at Arizona State University, recently died. He was a member of the MAA for 27 years.

John J. Andrews, professor emeritus at St. Louis University, was an MAA member for 47 years.

Mabel Schmeiser Barnes, professor emeritus at Occidental College, died at the age of 87 on February 22, 1993. She was an MAA member for 41 years.

Edward Maurice Beesley, professor emeritus at the University of Nevada-Reno, has died. He was an MAA member for 54 years.

May Beeken, professor emeritus at Immaculate Heart College, was an MAA member for 68 years.

Emil Berger, retired, was a member of the MAA for 44 years.

William L. Carter, distinguished professor and chancellor emeritus, died on December 30, 1993, at the age of 68. He was an MAA member for 41 years.

George Cherlin, VP Actuary for General Life Div., died at the age of 70.

Ralfe J. Clench, retired instructor at Queens College, died on August 4, 1993. He was an MAA member for 34 years.

Esther Comegys, associate professor at the University of Maine, died at the age of 95. She was an MAA member for 44 years.

Mary L. Cummings, retired, Chambers-burg, Illinois, has died. She was an MAA member for 44 years.

James Crabtree, adjunct professor, Stevens Institute of Technology, died on August 10, 1993. He was a member of the MAA for 19 years.

Glenn S. Curtis, New Milford, Connecticut, has died at the age of 36. He was an MAA member for 3 years.

John Daly, professor emeritus at St. Louis College, died on June 22, 1993 at 77. He was an MAA member for 40 years.

John J. Dranchak, associate professor, University of Portland, died on May 8, 1994, at

*Please see **In Memoriam** on page 39*

Letters of Recommendation

The fake letter of recommendation printed in the February issue of FOCUS (page 5) reminded former MAA President Leonard Gillman of two actual letters that he came across some years ago. In order to protect those involved, the date and the names of the individuals concerned have been changed, but apart from that, what you see is what was sent out.

May 23, 1964

Dear Professor Carter:

Mr. John Fabricant, about whom you asked in your letter of May 21, has a calm, almost reticent appearance which is in distinct contrast to his strong individualism and energy. In addition to his regular teaching load, he has two sections in the local community college. As if this were not enough, he is an ardent organizer of seminars for staff and graduate students; at one time in the first semester he had five seminars going, each meeting at least once a week.

He is a strong proponent of mathematics and works hard to instill modern methods in his students from Freshmen through Graduate Students. In fact he is writing a text on elementary calculus, putting forth his ideas about how the subject should be taught. He keeps the secretary busy preparing supplementary notes for his courses; some of the material in his notes for a graduate course cannot be found in published form.

I appreciate your concern about stealing one of my men so late in the year, but if he decides to cast his lot with you, I will not blame you nor will I hold it against this ambitious young man for his desire to advance himself.

Sincerely yours,

Sam Ortwiler
Chairman, Department of Mathematics

May 23, 1964

Dear Professor Carter:

If you can use John Fabricant, about whom you asked in your letter of May 21, you are welcome to him. In all of my teaching career I have never seen such an overbearing and irresponsible young man. He has utter contempt for any except the top 5% of his undergraduates, and thinks all of our graduate students are bums of the first order. He pays no attention whatever to prescribed content of the courses he teaches and presents whatever he pleases, even to subjecting his freshmen to integration via Baire classification of functions.

He talks a good game of Mathematics but, as with most grandstand experts, makes a very poor showing when he gets into the game himself. For example, he organized a seminar in partial differential equations with the express purpose of presenting the latest topological approach. After six weeks of perfectly standard stuff covered in less than a semester of Alice Germaine's senior course, he suddenly announced that that was all. He was supposed to have his degree when he came to us last fall but doesn't have it yet. Professor Arthur, who was here last week, says that Fabricant has submitted his final version of the thesis three times, and each had glaring mistakes.

His delusions of grandeur are so great that he cannot be bothered with such things as getting to class on time and does not bother to go to class at all if the spirit moves (or doesn't move) him. In a community college class (where the students are mature men who work during the day and want their money's worth) he has missed 4 classes, called off 3, had a substitute 3 times, and has never been there earlier than 10 minutes late and frequently 20 to 30 minutes late; and all this during a single semester. He is over a month behind in notes he promised the class, and has not handed back the one examination he gave.

I could go on, but what is the use. PLEASE take him away.

Sincerely yours,

Sam Ortwiler
Chairman, Department of Mathematics

President's Report

Donald L. Kreider

One year ago I wrote in my report in FOCUS that it seemed hardly possible that my term as president was already underway so soon after being tutored by former President Debbie Haimo. This past year has been a very active one, indeed, and now I am already looking to my successor Ken Ross as the next president of the MAA. One's term as president is very brief, yet I now realize how much wisdom there is in the two-year term established by our bylaws. The MAA is a vibrant organization, with an enormous amount of good work being carried out by hundreds of volunteers. That is our strength. Yet it is nearly a full-time job to track and support this work, let alone participate in it.

One of the truly exciting things to emerge this year is the MAA's development of electronic services. After a year of planning by our Committee on Electronic Services and the MAA staff, a Sun workstation has been added to our computer network in the Washington office to serve as a gateway to the Internet, and both e-mail and electronic information services are now available. The June FOCUS announced the MAA Gopher, accessible to all MAA members connected to the Internet, and encouraged people to try it out. The information available on the gopher, as well as its organization, will grow and change over time in response to comments received. But already it is a valuable source of information for the MAA's activities and projects being carried out by others. It clearly has potential for improving and extending communication among our members, committees, sections, and Board of Governors.

Last year I proposed an initiative to report progress in undergraduate mathematics education. In response to challenges to revitalize undergraduate mathematics, issued in recent years in publications of the MAA and other organizations, many departments have adopted exciting new approaches to teaching calculus and other mathematics courses. The level of such activity is higher than most imagine, yet it is difficult to keep in touch with the range of ideas available in our community or to obtain information that would help emulate the best ideas at our own institutions. The proposed initiative was to launch an electronic database, as part of the introduction of electronic services, that would facilitate the dissemination of information about successful instructional programs. The beginnings of this database are now available on the MAA Gopher. Some thirty colleges and universities have already included descriptions of programs that they believe are of interest to others, and we expect this number to grow rapidly. Each entry in the "Measuring Progress" database lists contact persons who have promised to respond to inquiries and requests for more information or materials. The ultimate purpose is to enhance communication among departments who are actively trying new things, to make it easier to learn what others are doing, to celebrate successes, and to learn from failures. Plans are underway to coordinate a set of articles in MAA publications and activities at MAA national and section meetings that will contribute to the database. I urge you to look at this "corner" of the MAA Gopher, to point it out to your colleagues, and to submit an entry about your own department's revitalization efforts.

The mathematical community is amazingly complex. Some fifteen mathematical organizations comprise the Conference Board for the Mathematical Sciences, each one with a mission specialized to the interests of its own members—mathematical research, collegiate mathematics, industrial mathematics, mathematics in the nation's schools, special responsibilities of two-year colleges, actuarial science, statistical sciences, operations research, and on and on. Each of our organizations exists to serve the interests of its members and to enhance their work. Yet there are times when we must look outside our own organizations to see the full range of problems confronting mathematics and mathematics education. The forces that shape our discipline go beyond our own intellectual efforts to do mathematics, extend mathematics, and teach mathematics. Those forces include, among others, society's aspirations for a better life, addressing what are perceived as overriding problems of our society—health care, homelessness, violence, and equal access to quality education. Since the ultimate support for our mathematical work comes from this very same society, we must continually examine whether we do, indeed, contribute to the general welfare of all citizens. It is in this context that the MAA has drawn ever closer to its sibling mathematical organizations. Convincing the country at large, and political leaders in particular, that mathematics is a unique and important resource for the nation, requires the joint effort of all mathematical societies. And addressing the daunting problems of mathematics education in our schools, colleges, and universities likewise demands closing ranks with our colleagues.

And it is for similar reasons that one of the MAA's most active committees is its Science Policy Committee. Under the very able leadership of its chair, Christine Stevens, it is developing guidelines for the MAA to participate in the strange world of people and politics, while preserving our primary internal mathematics and teaching goals. With care, we can make an impact on some of the nation's larger problems while keeping our focus on important problems of our own—revitalizing undergraduate instruction, identifying and encouraging students who can be future mathematicians, encouraging underrepresented groups to continue their study of mathematics and to consider careers in mathematics and science, and improving the education of tomorrow's teachers. Even these, however, require a view of mathematics education that transcends the traditional bounds of school, college, and graduate school. Thus the MAA continues to work closely with the American Mathematical Society (AMS) and the Society for Industrial and Applied Mathematics (SIAM) under the umbrella of the Joint Policy Board for Mathematics (JPBM). Here we join hands in matters of government relations, science and education policy, and public awareness of mathematics. We work closely with the National Council of Teachers of Mathematics (NCTM) and the American Mathematical Association for Two-Year

Colleges (AMATYC) under the umbrella of CBAMN (Cooperative Board for AMATYC, MAA, and NCTM). Here we work together on educational matters that cross lines of schools, two-year and community colleges, and four-year colleges and universities.

It remains truly amazing to me that the mathematical community, while so divided in its organizational structure, has gained the reputation nationally of "having its act together". Our solidarity is important in gaining wider support for mathematics. And it contributes directly to our own internal interests as well.

The Division of Undergraduate Education (DUE) at NSF has launched a new initiative on "Mathematical Sciences and their Application throughout the Curriculum". It replaces (or broadens) the Calculus Project that NSF had sponsored for the past several years. That project was one of the most visible and successful ever mounted by NSF, as evidenced by the number of departments that have significantly changed the way they teach mathematics courses. Most such changes have been internal to mathematics, however, and NSF now seeks through its new initiative to achieve more "systemic" change across disciplines. There are risks for mathematics in the broader initiative. But there are also opportunities. If, indeed, we have come to understand our teaching mission better we should welcome the chance to spread our ideas more broadly to the other sciences and engineering.

Last November the MAA's Executive and Finance Committees devoted a major block of time to a discussion of mathematics competitions and to ways that competitions can be better coordinated. Hundreds of thousands of young people participate each year in a myriad of mathematical competitions, the largest of which are MAA's own competitions—the Junior High School Mathematics Examination, the American High School Mathematics Examination, the American Invitational Mathematics Examination, and the USA Mathematical Olympiad. The MAA and the National Council of Teachers of Mathematics (NCTM) have formed this year a Joint Task Force to examine the full range of competitions available to students, consider possible new forms of competitions, and explore the possibility of multiple routes to the USA Mathematical Olympiad. This is a very fruitful area for cooperation between the MAA and NCTM and I am personally pleased that it is going forward. I am also pleased with the cooperation and enthusiasm in this venture of our own Council on Competitions and Committee on American Mathematical Competitions. These are the groups that make the MAA's competitions work. And their expertise and participation is needed to enable the Joint Task Force to meet its charge.

Again this year I was able to visit numerous MAA sections. This is certainly one of the more desirable privileges of the president. Here one sees the MAA in action, with rich mathematical programs, special events for undergraduate students, invited speakers, panel discussions on current topics, and a collegial spirit that gladdens the heart. We should never forget that three times as many MAA members attend their section meetings each year as attend the annual meetings. The vitality of our organization truly resides out there in the 29 sections that are sensitive to the needs of members and schools in their geographical areas and that provide opportunities for many more people to participate in the affairs of the MAA. The sections are a key link between our members and the work of the Association at the national level.

Since my report last year the national meetings in Vancouver and Cincinnati have taken place. Both were exciting meetings, with rich and diverse programs. And both enjoyed beautiful and adequate facilities for the meetings. The amount of effort that our program committees expend on preparing these meetings should be recognized fully. The program committees operate largely behind the scenes, and they demand enormous dedication and time from their members. Yet year after year the program committees put together truly wonderful mathematical programs. I take this opportunity to say thanks to all the people who agree to give their time on our behalf. The program committees are just the tip of the MAA committees iceberg. Most of our work is carried out by members who volunteer their time for section activities and for our more than 100 committees and councils.

More than anything else I value the spirit of collegiality and civility that distinguishes the MAA. We are an organization open to all who are interested in mathematics and mathematics education. And we are open to criticism when it is warranted and change when it is needed to move toward our goals. Let us, above all, preserve those aspects of the MAA.

1993 MAA Annual Report

Contents

From the Executive Director's Desk

Keeping Up

Marcia P. Sward

"Keeping up" is fast becoming one of the greatest challenges we face. As students and professionals in the mathematical sciences, we all must find ways not just to cope with the increasingly rapid rate of change, but to welcome it, and make it work to our benefit and the good of society.

As I look back at 1993, change is the theme that stands out most strikingly — the need to "keep the MAA up" with all the changes within our community as well as external forces that impact on collegiate mathematics, and the need to help MAA members keep up with the rapid pace of change in their lives and work.

In 1993, we took some fundamental steps to position the MAA to serve its members better. These included installation of a sophisticated computer network at MAA Headquarters and renovation of our historic buildings, work that has been proceeding in stages over several years.

During 1993, much thought also went into program planning, as the finishing touches were put on the five-year MAA Strategic Plan (approved by the Board of Governors in January 1994). As with any strategic plan, however, no sooner was the Plan completed and approved than it was already out-of-date and in need of updating.

Publications

On the publications front, 1993 saw the premiere issue of *Math Horizons*, MAA's first magazine for students. *Math Horizons* was in the planning stages for four years, as we fleshed out our initial ideas for the magazine and sought funding for its inauguration. I am delighted to report that subscriptions are pouring in, with the most recent count at 13,100.

FOCUS has not exactly been taking a back seat to all these other activities. I'm sure that all readers of FOCUS noticed its spiffy new look, inaugurated with the February 1994 issue. As Founding Editor of FOCUS (1980-85), I admit to some qualms over Editor Keith Devlin's plans for changes in FOCUS. But the results speak for themselves—FOCUS has a clean, contemporary look, and is providing readers

with more valuable information than ever before. Thanks, Keith!

During the past few years, the MAA Publications Program has grown dramatically and is achieving new critical acclaim. Under Associate Executive Director Donald Albers' inspired leadership, publications sales doubled from 1990 to 1993, with hopes of going over $1,000,000 in 1995. A new series, *Classroom Resource Materials,* premiered in 1993 with *Proofs Without Words*. MAA books swept the 1993 mathematics awards of the Professional and Scholarly Publishing Division of the Association of American Publishers—*Knot Theory*, by Charles Livingston, received "Best Mathematics Book of 1993" and *The Search for E.T. Bell*, by Constance Reid, received an Honorable Mention.

Electronic Services

In 1993 we spent much time planning for MAA Electronic Services, and making basic decisions about hardware, software, staffing, structure, policies, and goals. After months of development and pilot testing, the MAA Gopher (the first component of MAA Electronic Services) is now up and running. Even in its current incipient stage, it is already a rich resource of information for collegiate mathematics students and faculty, and for anyone interested in college-level mathematics. The "Celebrating Progress" database in the Gopher contains valuable information on 31 successful projects and programs in mathematics departments in the U.S. and Canada. If you haven't already checked it out, just call MAA's Gopher at "gopher. maa.org", explore the Celebrating Progress database and any other items of interest to you. Let us know what you think about the Gopher, and tell us what else you would like to see in it. We are convinced that MAA Electronic Services will become one of MAA's most important and most popular services.

Externally Funded Projects

Over the past few years, MAA has been increasingly successful in competing for external grants. In 1990, the grand total of external grants to the MAA was $704,694. In 1993, that total had grown to $1,593,270. These grants help us greatly extend the reach of the MAA, as we seek to encourage students in their study of mathematics, assist new faculty as they assume new roles and responsibilities, and provide guidance on issues of curriculum and pedagogy, diversity, professional development activities, computer resources, etc.

One exciting example of an externally-funded project is Project NExT (New Experiences in Teaching). We secured funding from the Exxon Education Foundation late in 1993. The first Project NExT Workshop will be held in Minneapolis this summer. Through workshops, minicourses, electronic networking, and mentoring, Project NExT will seek to meet the needs of faculty members who are at the beginning of their collegiate teaching careers.

Another program of which we are very proud is SUMMA (Strengthening Underrepresented Minority Mathematics Achievement), which has leveraged $677,000 in external grants into $5.8 million for mathematics intervention programs for minority students across the country. These programs are reaching some 12,000 minority students in middle and secondary school.

Our Career Information Program provides an example of what can be accomplished through collaboration. Conducted with funding from the Department of Energy and carried out in collaboration with 14 other mathematical sciences societies, the Career Information Program has already reached an estimated audience of 70,000, including 10,000 guidance counselors. All MAA members received copies of "Mathematical Scientists at Work" together with the December 1993 issue of FOCUS.

Conclusion

The projects and programs described above only barely touch on the rich panorama of MAA activity, run by an army of dedicated volunteers. The MAA is indeed an organization on the move, actively planning for an exciting and productive future and seeking new and more effective ways of serving the needs of its members and community.

MAA Financial Report

Gerald J. Porter, Treasurer

I am pleased to report that the Mathematical Association of America finished 1993 in a strong financial position despite a deficit in the general fund balance (see below). The highlight of the year was the appearance of *Math Horizons*, our new periodical for undergraduates. Don Albers is to be commended for bringing this project to fruition at the same time that he has increased our overall publication program. All members should be proud of the MAA's book list which includes 15 new titles. We look forward to income from publications passing the million dollar mark in 1994.

The penultimate round of renovations of our headquarters building has been completed under the able supervision of Rhoda Goldstein. This was done with no provision for "swing space" and all our employees deserve thanks for their cooperation during this difficult time. In addition to the renovations, many of the offices have been refurnished so that the available space can be used as efficiently as possible. If you are in Washington, please stop by and visit our headquarters building.

Marcia Sward continues to provide sound administrative management for the Association while simultaneously initiating innovative new programs. We are fortunate that we have such an able Executive Director.

Over the past two years the MAA has installed a distributed computing system in our headquarters building. Conversion of most of the administrative systems is complete but work remains to be done. As usual, projects of this type take longer than anyone anticipates. The MAA plans to provide a wide variety of electronic services. The first of these services is the MAA Gopher, installed by Fred Rickey and Anita Solow, to provide information to the membership electronically. You may access it (if you have a gopher client) by typing 'gopher math.maa.org' (don't type the quotes).

MAA non-publishing income is heavily dependent upon dues and grants. Taking into account that portion of dues income that pays for journal subscriptions, 62.5% of general fund income is directly related to book and journal sales. Over 82% of the remaining income comes from the portion of dues income that is not allocated to journal support. An active recruitment program over the past few years increased MAA membership to a high of 33,000 in 1992. That program is no longer as successful and the number of our members has leveled out at slightly more than 30,000. In 1993 we overestimated dues income. This contributed to the deficit in our budget mentioned above. As we plan for the future we must do so without anticipating growth in membership. This means that as we study new programs and activities we must, at the same time, review older programs and assess their worth.

The Outcomes in 1993

There are several measures of the Association's fiscal health. These include our general operating budget, grant activity, our real estate holding, and our investment fund. We discuss each of these individually.

General Fund

The General Fund is the MAA's unrestricted operating fund. Income to the General Fund comes from members' dues, publication sales, interest on working capital and contributions. Expenses include publications, management, supplies, non-externally funded program support, allocated building expense, and support of sections. General Fund expenditures in 1993 accounted for $3.9 out of total expenditures of $6.3 million.

During 1993 the General Fund showed a deficit of $35,871 compared to a surplus of $100,700 in 1992. It is the goal of the Finance Committee that the General Fund be in balance; however, we realize that some years may have surpluses while there are deficits in others. For that reason we also look at the result over longer periods of time.

Year	General Fund Balance (rounded to nearest $1,000)
1993	($36,000)
1992	$97,000
1991	$52,000
1990	$101,000
1989	($75,000)
5 year total	$139,000

As is indicated, over the past five years we have an accumulated balance of $139,000. That balance provides us with a cash flow to enable us to make capital expenditures

1993 REVENUES AND EXPENDITURES WITH 1992 FOR COMPARISON

Revenues	**1992**	**1993**
Dues	$2,115,000	$2,121,000
Grant Supported Programs	1,176,000	1,475,000
Book Sales/Pamphlets/Videos/UME Trends	777,000	917,000
Journal Subscriptions/Advertising/Royalties	612,000	614,000
Mathematical Competitions	690,000	617,000
Contributions	130,000	134,000
Interest/Dividends/Capital Gains	155,000	120,000
USA and IMO Mathematical Olympiad	115,000	110,000
Building Fund Contributions and Rental	195,000	141,000
Miscellaneous	82,000	44,000
TOTAL REVENUES	**$6,047,000**	**$6,293,000**
Expenditures		
Membership Recruitment and Retention	$424,000	$519,000
Grant Supported Programs	1,256,000	1,557,000
Book Sales/Pamphlets/Videos/UME Trends	1,106,000	1,184,000
Journals	1,525,000	1,550,000
Mathematical Competitions	609,000	606,000
General Programs and Services	380,000	479,000
Development	58,000	63,000
USA and IMO Mathematical Olympiad	115,000	110,000
Building Operations	141,000	175,000
Miscellaneous Programs	49,000	58,000
TOTAL EXPENDITURES	**$5,663,000**	**$6,301,000**

without bank borrowing. Those capital expenditures are depreciated over time.

Restricted Funds

The Restricted Fund includes externally funded projects and the American Mathematics Competition (AMC). Grant revenues during 1993 totaled $1,475,000. This includes grants to support SUMMA, *Math Horizons*, Calculator workshops, the IMTP project, and myriad other projects that support collegiate mathematics education. The AMC is responsible for operating the high school and junior high school mathematics contests as well as the Math Olympiad. During 1993 restricted income totaled $2,227,350 while expenses totaled $2,296,680.

Building Fund

Several years ago the Finance Committee made the decision to separate the Building Fund from the General Fund so that the expenses associated with renovation of our buildings would be isolated from the day-to-day operating budget of the Association. Space costs are allocated to the general fund as a fixed yearly charge. This allocation together with rental income from our other tenants and contributions constitute income to the Building Fund. Expenses include operating expenses, debt service, capital improvements, and principal payments on our mortgages. Because of the recent renovations on our buildings there is a cumulative deficit in the building fund. As our mortgages are reduced and interest costs decline, that income will be used to reduce and eventually eliminate this deficit. During 1993 our mortgage indebtedness declined from $393,903 to $338,577 while our accumulated deficit in the cash building fund increased from $199,263 to $325,607. Taking advantage of the favorable interest rates we combined our two mortgages into a new mortgage which we plan to pay off in early 1998.

During the past four years we have completed $980,599 in building renovations. This was paid for with $593,343 from the Building Fund Drive, $61,649 of increased indebtedness, and $325,607 from the building cash flow. We have just completed refinancing our mortgage and we have an outstanding balance of $338,577. This amount will be paid off by 1998 with funds coming from the building fund cash flow. Beginning in 1998 the building cash flow will be used first to reduce the cumulative cash flow deficit ($325,607 at the end of 1993) and then to build a fund for future renovations and maintenance.

Investment Fund

The MAA Investment Fund includes both restricted and unrestricted endowment funds. The earnings and capital gains from our investments are retained with the exception of funds that are intended to support specific activities such as the Sliffe awards to high school teachers. During 1993 the investment fund increased from $1,461,980 to $1,558,245 after taking account of a transfer of $42,000 to support designated programs.

Two members of the Finance Committee should be recognized for their many contributions to the Association. John Kenelly and Barbara Faires are the elected members of the Budget Committee. They have done a superb job in preparing and monitoring the budget, making mid-course corrections, and anticipating future needs. In addition, John has played a pivotal role in helping the Association put its headquarters building in order by guiding their renovation, supervising the financing of the renovations, and leading the Building Fund drive. We all owe Barbara and John our appreciation for a fine job done.

In summary, the MAA has the financial strength and capable management required to support the leadership position that we have assumed in collegiate mathematics. The true strength of the MAA, however, is our members. Their involvement in MAA activities at both the Section and national level provides the energy for the organization and the foundation for its future.

CONSOLIDATED MAA BALANCE SHEET

	December 31, 1992	December 31, 1993
Current Assets		
Cash	$132,495	$325,655
Liquid Assets	1,233,202	979,437
Accounts Receivable	818,545	841,298
Publications Inventory	273,939	320,317
Prepaid Expenses	254,319	142,495
TOTAL CURRENT ASSETS	$2,712,500	$2,609,202
Non-Current Assets		
Investments (at cost)	$921,305	$993,593
Furniture and Equipment	862,890	1,079,182
Building (at cost)	816,456	816,455
Building Improvements (at cost)	930,369	1,171,856
Accumulated Depreciation	(809,354)	(959,438)
Deferred Development Costs	199,434	127,780
TOTAL NON-CURRENT ASSETS	$2,921,100	$3,229,428
TOTAL ASSETS	**$5,633,600**	**$5,838,630**
LIABILITIES AND FUND BALANCES		
Current Liabilities		
Accounts Payable	$293,175	$450,964
Accrued Royalties	41,482	47,478
Other Accrued Liabilities	78,669	83,646
Prepaid Dues and Subscriptions	1,959,807	1,967,903
TOTAL CURRENT LIABILITIES	$2,373,133	$2,549,991
Long Term Liabilities		
Mortgage Payable	$393,902	$338,577
Unexpected Grant Receipts	364,937	457,105
TOTAL LONG-TERM LIABILITIES	$758,839	$795,682
TOTAL LIABILITIES	$3,131,972	$3,345,673
Fund Balances		
Unrestricted Fund Balances	$943,889	$945,961
Restricted Fund Balances	977,701	954,887
Endowment	580,038	592,109
TOTAL FUND BALANCES	$2,501,628	$2,492,957
TOTAL LIABILITIES AND FUND BALANCES	**$5,663,600**	**$5,838,630**

MAA Staff List

Executive

Marcia P. Sward, Executive Director
Mary McLean Bancroft, Executive Assistant
Meredith S. Zimmerman, Executive Secretary

Development

Richard M. Witter, Development Consultant
Maureen A. Callanan, Development Assistant

Publications and Programs

Donald J. Albers, Associate Executive Director, Director of Publications & Programs
Lisa Johnson, Assistant to Associate Executive Director
Amy E. Stephenson, Production Specialist

Production and Marketing

Elaine Pedreira, Production & Marketing Manager
Carol A. Baxter, Assistant Production & Marketing Manager
Beverly J. Ruedi, Electronic Production Specialist
Kathleen H. Knust, Publications Sales Assistant
Phil Moors, Publications Sales Assistant

Editorial

Harry Waldman, Journals Editorial Manager

Programs

Andrew Sterrett, Assistant Director of Programs
Jane S. Heckler, Senior Assistant for Programs
April White, Programs Secretary

Finance and Administration

Rhoda D. Goldstein, Associate Executive Director, Director of Finance & Administration
Sabrina Mitchell, Assistant to Associate Executive Director

Accounting

Tracy L. Terry, Accounting Supervisor
Valerie Cooper, Accounting Assistant

Reception

Robin Chapman, Receptionist and Office Operations Coordinator

Mailroom

Eric Aiken, Mailroom Supervisor

Computer Network

Joseph Cody, Computer Network Administrator

Membership and Subscriptions

Kay Lamont, Membership/Subscriptions Manager
Janet Petrillo, Membership/Subscriptions Assistant Manager
Sarah Knight, Membership Assistant
Frederica N. Watson, Membership Assistant

Office of Minority Participation

William A. Hawkins, Jr., Director
Florence Fasanelli, Director of SUMMA Intervention Programs
Lana Bilyeu, Administrative Assistant

MAA Board of Governors

Prior to conclusion of the MAA Business Meeting in Cincinnati, Ohio, January 1994

Officers

President, Donald L. Kreider, Dartmouth College (93-94)
Past-President, Deborah Tepper Haimo, University of Missouri at St. Louis (93)
First Vice-President, Susan L. Forman, Mathematical Sciences Education Board and CUNY, Bronx Community College (92-93)
Second Vice-President, Sharon C. Ross, DeKalb College (92-93)
Secretary, Gerald L. Alexanderson, Santa Clara University (90-99)
Treasurer, Gerald J. Porter, University of Pennsylvania (92-97)
Associate Secretary, Kenneth A. Ross, University of Oregon (90-93)

Additional Members of the Board of Governors

Ex-President

Leonard Gillman, University of Texas at Austin (89-94)

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Chair, Committee on Sections, John D. Neff, Georgia Institute of Technology (93)
Editor, Martha J. Siegel, Towson State University (91-95)

Elected Members of the Finance Committee

Barbara T. Faires, Westminster College (93)
John W. Kenelly, Clemson University (92-95)

Governors at Large

Bettye D. Forte, Fort Worth Independent School District (93-95)
Shirley A. Hill, University of Missouri at Kansas City (91-93)
Johnny L. Houston, Elizabeth City State University (92-94)
S. Brent Morris, National Security Agency (91-93)
Eric R. Muller, Brock University (92-94)
David A. Sanchez, Texas A&M University System (93-95)

***Journal Editors* (Terms end December 31)**

Bart Braden, Northern Kentucky University (94-98)
John H. Ewing, Indiana University at Bloomington (92-96)

***Sectional Governors* (July 1, 1991-June 30, 1994)**

Kansas, Kendall O. Griggs, Hutchinson Community College
Missouri, Curtis N. Cooper, Central Missouri State University
New Jersey, Ruth D. O'Dell, County College of Morris
Northeastern, Dennis M. Luciano, Western New England College
Ohio, Olaf P. Stackelberg, Kent State University
Pacific Northwest, Larry A. Curnutt, Bellevue Community College
Seaway, Rebecca E. Hill, Rochester Institute of Technology
Southeastern, Mary M. Neff, Emory University
Southwestern, David R. Arterburn, New Mexico Institute of Mining & Technology

***Sectional Governors* (July 1, 1992-June 30, 1995)**

Eastern Pennsylvania & Delaware, Marvin L. Brubaker, Messiah College
Florida, Lee H. Armstrong, University of Central Florida
Illinois, Albert D. Otto, Illinois State University
Intermountain, Lawrence O. Cannon, Utah State University
Iowa, Lynn J. Olson, Wartburg College
Louisiana-Mississippi, Donald M. Bardwell, Nicholls State University
Maryland-D.C.-Virginia, Elizabeth J. Teles, National Science Foundation and Montgomery College
Michigan, Hugh L. Montgomery, University of Michigan
North Central, John M. Holte, Gustavus Adolphus College
Southern California, James O. Friel, California State University at Fullerton
Texas, John Ed Allen, University of North Texas

***Sectional Governors* (July 1, 1993-June 30, 1996)**

Allegheny Mountain, Kathleen Anne Taylor, Duquesne University
Indiana, Catherine M. Murphy, Purdue University at Calumet
Kentucky, Christine A. Shannon, Centre College
Metropolitan New York, Theresa J. Barz, St. John's University
Nebraska, Melvin C. Thornton, University of Nebraska at Lincoln
Northern California, John A. Mitchem, San Jose State University
Oklahoma-Arkansas, Edward N. Mosley, Arkansas College
Rocky Mountain, Celestino G. Mendez, Metropolitan State College of Denver
Wisconsin, Robert J. Fraga, Ripon College

All committee member terms expire at the end of the annual winter meeting following the year listed, unless otherwise noted.

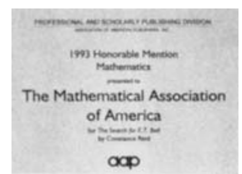
Publications—A Big Year

The year 1993 was a very important year for MAA Publications. First of all, *Math Horizons*, our new magazine for students, debuted after considerable planning and hard work by hundreds of people, bolstered by financial support from the Exxon Education Foundation, the William and Flora Hewlett Foundation, and the National Science Foundation. The response to *Math Horizons* has been fantastic and we are looking forward to our second year of publication. Second, book sales reached $783,000, 10% ahead of 1992 and 47% ahead of 1991 sales. These record sales underscore in bold terms your interest in MAA books for both personal use and classroom use.

The Committee on Publications under the dynamic leadership of Jim Daniel continues to find and develop books that you like. We are very proud of our books and are extremely pleased by the recognition that our books have received over the past year.

Don Albers, Director of Publications and Programs

In 1993, for the first time, we entered MAA books in the annual competition of the Professional and Scholarly Division of the American Association of Publishers. MAA books swept the mathematics awards, with *Knot Theory* by Charles Livingston taking the top prize and *The Search for E.T. Bell* by Constance Reid capturing second place. Of course, we will enter the 1994 competition as well.



Another source of recognition for Association books can be found in reviews. Here's a sampling of recent reviews, which helps explain our pride in MAA books and our wonderful authors.

Game Theory and Strategy

by Philip D. Straffin, Jr.

"*Game Theory and Strategy* is an elegant, crystal-clear expository work. Philip Straffin presents the key ideas behind finite games in strategic and coalitional forms and provides many simple and intuitively appealing examples of applications to business, politics, economics, social psychology, philosophy and evolutionary biology. Key concepts are emphasized and clearly explained. Here is a book for interested lay people, undergraduates or graduates with little knowledge of mathematics: even high school seniors might appreciate it."

—*Nature*

Exploring Mathematics with Your Computer

by Arthur Engel

"The author's style is pleasant, clear and precise, and his choice of material is superb.... Professor Engel's examples and algorithms are real gems. . . . this book is a gold mine and I will return to it many times to dig out more nuggets. Congratulations, Professor Engel, for one of the best texts I have seen; it is highly recommended."

—*Mathematical Spectrum*

Thanks to you, it's working.The Association's publishing enterprise, that is—three journals, seven book series, FOCUS, *Math Horizons*, and a variety of special publications. With support from our talented professional staff, this venture succeeded this year through the volunteer efforts of 12 editors, 77 members of policy committees, 51 associate editors of journals, 38 members of book editorial boards, well over 300 authors, several hundred referees, plus many thousands of you readers.

Let Don Albers or me know if you'd like to join this volunteer army. And to those already enlisted, thanks for making this a great year!

Jim Daniel, Chair, Committee on Publications

Excursions in Calculus: An Interplay of the Continuous and the Discrete

by Robert M. Young

"This book belongs on the desk right next to one's current course texts (and not just the calculus texts). This book is one of those rare works that one can read from cover to cover with great pleasure and profit. Anyone with the least interest in mathematics will find something interesting and intriguing on just about every page and will in all likelihood not be able to stop with just one page.... Helping one's students to decompartmentalize their understanding of mathematics is in itself worth the price of the book."

—*Mathematical Reviews*

Complex Numbers and Geometry

by Liang-shin Hahn

"Hahn takes beautiful problems on triangles and circles, and shows how to solve them, one after another, with one beautiful trick—complex numbers! It's amazing that in the last two centuries nobody else systematically did plane geometry in this elegant, powerful way."

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REVIEWS OF BOOKS THAT WERE PUBLISHED IN LATE 1993 HAVE NOT YET APPEARED

Committee on Student Chapters

The Committee on Student Chapters continues to create and support activities at the chapter, section, and national levels for students interested in mathematics. The committee's work on all three levels is anchored at the national office of the MAA by Andy Sterrett and Jane Heckler.

There are currently 411 MAA Student Chapters in the country, with a total membership of about 4000. The Committee on Student Chapters provides a forum for all chapters with the newsletter *Chapter News* which is sent twice a year to all chapter advisors. *Chapter News*, with Deborah Frantz of Kutztown University as its editor, contains ideas for student activities at the chapter level, as well as information on the national meetings, and information on summer research opportunities and on careers in mathematics. The Committee on Student Chapters also provides an opportunity for chapter advisors to meet with each other and share interesting chapter experiences at the national meetings, where the Committee on Student Chapters and Pi Mu Epsilon hold Joint Advisors' Breakfasts.

At the section level, the Committee on Student Chapters has completed the Section Coordinators' Handbook, which provides coordinators with ideas for activities at the section level and resource information on career opportunities in mathematics, among other things.

The Committee on Student Chapters gratefully acknowledges the support of the Exxon Education Foundation. Part of such a grant was used in the academic year 1993-94 as mini-grants to sections to include activities appropriate to undergraduates in section meetings or other section activities. Nine sections each received $900. The activities funded by these grants include career conferences for undergraduates, joint activities between chapters, outreach to secondary and middle school groups, special talks on mathematics and the environment, or the interaction of mathematics in an area of social concern. The Committee on Student Chapters has received a fourth grant from the Exxon Education Foundation, part of which will be used to fund activities at the section level for the academic year 1994-95. Sections have been asked to submit proposals to implement programs to attract minority students to participate in section activities, or to implement programs for students that illustrate applications of mathematics to contemporary problems of society, or to conduct career fairs or otherwise disseminate information regarding the wide variety of careers open to students of mathematics.

At the past two national meetings in the winter, Karen Schroeder of Bentley College has organized a Special Paper Session of contributed papers pertaining to activities at the chapter and section levels. These sessions have served many chapter advisors and section coordinators who are eager to try new events, but are concerned about the success of the venture.

The national meetings have seen an explosive growth of programming for undergraduate members of the MAA. Some of the activities regularly sponsored by the Committee on Student Chapters at both the summer and the winter national meetings are a Student Lecture (which is followed by an ice cream social at the winter meetings), a Student Workshop, and the Hospitality Center. MAA Student Paper sessions are sponsored by the Committee on Student Chapters at each summer national meeting, as is a student reception hosted jointly with Pi Mu Epsilon. Ben Fusaro of Salisbury State University works with the Mathematical Contest in Modeling to get two winning teams from the MCM to present their winning solutions at the paper sessions.

The 1993 Summer Meeting held in Vancouver was sponsored jointly with the Canadian Mathematical Society. The Committee on Student Chapters invited two Canadian nationals to present the Student Lecture and Workshop. Richard K. Guy of the University of Calgary presented a talk titled "The Unity of Combinatorics," while Stan Devitt of MAPLE and the University of Waterloo presented the Student Workshop on "Using *MAPLE* to do Mathematics." There was a wonderful turnout for the MAA Student Paper Sessions, with thirteen undergraduate students presenting papers. Three prizes were awarded for the best presentations.

The winter meetings in January 1994, held in Cincinnati, were pure magic for undergraduate students. Both the Student Lecture, "Magic tricks, card shuffling, and dynamic computer memories," and the Student Workshop, "Calculated deceptions," were presented by S. Brent Morris of the National Security Agency.

The 1994 summer meetings will be held in Minneapolis, and the program is full of events targeted to undergraduate students. Gail Nelson, of Carleton College, will deliver the Student Lecture on "What is really in the Cantor Set?" while the Student Workshop on "The theory and practice of juggling" will be presented by Joe P. Buhler of Reed College and Ronald L. Graham of AT&T Bell Labs. MAA Student Paper Sessions will be run, as usual, by Ronald Barnes of the University of Houston–Downtown. As in the past few years, the MAA Committee on Student Chapters has some funds for travel for student paper presenters. For the first time, the prizes for best presentation this year will carry a cash award of $100 each. The Hospitality Center, a place for puzzles, contests, information, and respite from the busy pace of the meetings, will operate during the MathFest. It will be run again by Richard S. Neal of the University of Oklahoma.

The Committee on Student Chapters has worked hard to contact minority institutions directly and to discuss the involvement of their students with mathematics. W. Howard Jones of the University of the District of Columbia and Joanne Darken of the Community College of Philadelphia have organized this effort. Those institutions which expressed interest in starting a mathematics club will be contacted with more concrete information on student chapters, and the others will be sent information on services provided by the MAA, particularly in career opportunities. Richard Jarvinen of Winona State University has headed an effort to bring students from Native American Colleges in Minnesota to the MathFest in Minneapolis this summer.

Cooperation between the Committee on Student Chapters and PME continues to grow. Many institutions have MAA Student Chapters which are virtually

*Please see **Student Chapters** on page 33*

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Student Chapters from page 30

indistinguishable from PME Chapters. The Committee on Student Chapters and PME now host a Joint Advisors' Breakfast at the national meetings; a common abstracts booklet lists student papers for both organizations; student paper sessions are held concurrently; awards for best presentation for both organizations are now comparable and are made at the PME Banquet; and travel funds for student speakers of both organizations are now similar. Robert Eslinger, Hendrix College, is president of PME and acts as liaison between the two organizations.

As other groups increase their efforts to involve undergraduates in mathematics activities, the Committee on Student Chapters hopes that they will avail themselves of the many opportunities already provided by the Committee on Student Chapters. The MAA Committee on Student Chapters is pleased to be of service to undergraduates interested in mathematics and invites all undergraduates to participate in the many activities at the chapter, section, and national levels described above.

For additional information on the MAA Committee on Student Chapters, contact Aparna W. Higgins, Chair, MAA Committee on Student Chapters, Department of Mathematics, University of Dayton, Dayton, OH 45469-2316; (513) 229-2511; FAX: (513) 229-4000; e-mail: higgins@udavxb.oca.udayton.edu.

Committee on Visiting Lecturers

In 1993, sixty-four lectures were given by thirty-four speakers of the 204 listed in the 1993-94 Program of Visiting Lecturers (PVL). The 1994 PVL booklet lists 187 lecturers and was distributed this spring.

Lecturers are prepared to present formal talks, as well as confer with students on opportunities for graduate study and employment. This year, the committee plans to encourage more participation in the program by the MAA Student Chapters.

Professor James G. Ware retired after six years of leadership on the committee.

The committee welcomes suggestions and comments for improving the program. Nominations of outstanding speakers for the program are encouraged. For additional information, nominations, copies of the 1994 PVL booklet, etc., contact Ron Barnes, Chair, MAA Visiting Lecturers Program, CMS Dept, University of Houston–Downtown, 1 Main St, Houston, TX 77002-1094; (713) 221-8553; e-mail: BARNES@DT.UH.EDU.

1993 Year End Membership Demographics

College and University Faculty	12,202
Student	8,397
Industry or Government	3,408
Secondary School Teachers	2,495
Retired or Unemployed	2,282
Other	1,643
TOTAL MEMBERSHIP	**30,427**

Committee on Sections

The Association charges the Committee on Sections to assist the 29 sections of the Association, to encourage communication among them, to act as liaison between the sections and the Association's national headquarters, to represent the sections to various constituencies, and to offer forums for the discussion of concerns of the various sections. The Chair of the Committee on Sections serves on the Board of Governors and on the Executive Committee of the Association to ensure avenues of communication among all levels.

The Committee on Sections hosts the Section Officers' Meetings each year at both the winter and summer national meetings of the Association. These forums strengthen the lines of communication between the national officers and the leaders of the sections.

At the Section Officers' Meetings in August in Vancouver, and in January in Cincinnati, topics of discussion included the new electronic services from the national headquarters of the Association; the *Math Horizons* project; the project Priming the Pump for Curricular Change; revised subventions to sections; the Pólya Lecturers' program; and the new section- and national-level awards for college and university teaching.

In all these matters and with regard to the workings of the committee itself, we are grateful to John D. Neff for his many years of service on the committee and for his sensitive leadership as its chair. John's term as chair ended in January.

The next Section Officers' Meeting will be on Monday afternoon, August 15th, at the MathFest 1994 in Minneapolis.

The vitality and diversity of the Association are manifest in its sections. The Committee on Sections endeavors to offer opportunities for sections to share innovations and successes and to seek help with current concerns. It welcomes input from all members of the Association.

For more information on sections, contact Mary McLean Bancroft, MAA, 1529 Eighteenth Street, NW, Washington, DC 20036; (202) 387-5200; e-mail: MBANCROF@maa.org.

SUMMA

William A. Hawkins

The goals of the Strengthening Underrepresented Minority Mathematics Achievement (SUMMA) Program of the MAA are to increase the representation of minorities in mathematics, science, and engineering and to improve the mathematics education of minorities. What has SUMMA accomplished in the past year?

Minority Participation in Mathematics The process by which the MAA undertook to study itself and establish an Office of Minority Participation in Mathematics is being replicated within the Conference Board of the Mathematical Sciences (CBMS). This organization, composed of the leaders of the fifteen major national mathematics organizations, has received a $25,000 grant from the Carnegie Corporation of New York to support a task force for planning how the entire mathematics community can begin to address the issue of minority participation. The idea for such a task force originated within SUMMA and the MAA Executive Department.

At MAA headquarters the Benjamin Banneker Room is now a reality. The office of the SUMMA director will be housed here. Banneker (1731-1806), a self-taught mathematician, astronomer, and free man of color, will be honored with his first formal recognition by the mathematics community in a dedication of the Banneker Room this fall.

The number of minority members of the Association who serve on committees and give presentations at section and national meetings continues to grow.

Funded Projects Since May 1991, SUMMA has awarded 49 small planning grants totalling $200,000. This effort to encourage college and university mathematics faculty to initiate or replicate intervention projects for minority middle and high school students has also been generously funded by the Carnegie Corporation of New York. A new proposal will be submitted to Carnegie in the fall. Should it be funded, the deadline for submitting a planning proposal (up to $5,000) will be February 1, 1995.

We expect 62 intervention projects to be conducted this summer by faculty who have received the small planning grants or technical assistance from SUMMA staff. The long-term goal is to have every mathematics department sponsor a project each summer for underrepresented minorities. By this summer, the original Carnegie funds will have leveraged more than $6.2 million from public and private sources.

The SUMMA Consortium (SUMMAC) will hold its third annual conference in Washington, D.C. in November 1994 for mathematicians directing intervention projects. 130 directors are expected. The SUMMAC network is growing rapidly as we discover more projects each year and the number of Carnegie-assisted projects increases. This $703,000 grant is now in its third and final year of funding from the NSF. A new proposal will be submitted.

Section workshops are continuing with SUMMAC funding. Presentations about successful projects will be given at the University of Minnesota in August 1994 and in San Francisco in January 1995. SUMMAC's newsletter, *Forum*, has now seen its sixth issue. And a third Directory of Intervention Projects listing mathematics-based intervention projects around the country will be available by the November conference.

The project Attracting Minorities into Teaching Mathematics (AMIT) was funded by the NSF to study the characteristics of undergraduate programs successful in attracting minority students into teaching mathematics at the secondary level. The full report is available for purchase from the MAA as conference proceedings that include invited papers from faculty at minority and majority institutions, a commissioned survey of sixteen states and fifty colleges of education, and recommendations from a blue ribbon panel for suggested actions by government, the mathematics/education community, the business community, and the public.

Although the proposed national collaborative for mathematics departments at minority institutions has not yet been funded (see below), the NSF has funded a related pilot project for mathematics faculty from historically Black colleges and universities.

The MAA is participating as a subcontractor to North Carolina A&T State University for $23,500. The Collegiate Curriculum Reform and Community Action Project (CCRCA) provides technical assistance to implement calculator-based curricular efforts fully and bring the faculty to the cutting edge of calculus reform. A major intent of the project is to encourage minority participation in AP Calculus and hence increase the number of minority undergraduates prepared for calculus-based courses. The Hewlett Packard company has donated a number of classroom sets of their newest calculators for use by the faculty after they complete a two-week summer institute at Morehouse College and Clemson University. Academic year follow-up will occur at two to three sites during four weekend sessions. It is hoped this pilot project can be enlarged to include Hispanic-serving institutions and tribal colleges in future years. The National Security Agency has given SUMMA $50,000.

Future Activities SUMMA proposes to develop a national collaborative focused on the needs, concerns, and strengths of mathematics departments at 52 selected minority colleges and universities because these departments have the best track record for nurturing minority mathematical talent. The first breakfast for these department chairs was held during the Cincinnati meetings in January 1994. The CCRCA pilot project is an outgrowth.

SUMMA proposes to provide technical support to the Dana Center, University of Texas at Austin, for a research summer school. Funded by the NSF, the summer school will include SUMMA's assistance recruiting minority faculty and students, and facilitation of meetings between Dana staff and faculty from minority institutions.

Because of difficulties in securing funding for mentoring pre-college minority students in mathematics, this activity is being redirected into a proposed joint program with the National Association of Mathematicians to mentor minority graduate students.

We are still seeking funding for an Archival Record, including pictures, of minority Ph.D.s in mathematics or mathematics education.

William A. Hawkins is the Director of the MAA Office of Minority Participation

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You're The Professor, What Next?

Ideas and Resources for Preparing College Teachers

Bettye Anne Case, Editor

You're the Professor, What Next? is a valuable guide for doctoral mathematical sciences departments wishing to prepare their advanced graduate students and postdoctoral instructors for collegiate teaching and related academic responsibilities. The book also will be useful to faculty mentors of new assistant professors and as personal reading for many, especially inexperienced, members of mathematics faculties.

Users will find discussion of a wide range of pedagogical issues, extensive references to other sources of information, and numerous practical suggestions. Forty essays, published for the first time, and a hundred reprinted articles provide a variety of views and reflections from the mathematical community. The centerpiece of the book is a collection of reports from eight graduate mathematics programs which piloted special seminars in teaching and professionalism for students about to receive Ph.D. degrees. Doctoral departments in other subjects may find this section helpful as they seek to establish discipline- based programs to enhance readiness for the professoriate.

362 pp., Paperbound, 1994

ISBN 0-88385-091-5

List: $24.00

Catalog Number NTE-35

The Words of Mathematics

An Etymological Dictionary of Mathematical Terms Used in English

Steven Schwartzman

The Words of Mathematics explains the origins of over 1500 mathematical terms used in English. While other dictionaries of mathematics define technical terms, this book concentrates on where those terms came from and what their literal meanings are.

As in any dictionary, the entries themselves are arranged alphabetically. The words are drawn from arithmetic, algebra, geometry, trigonometry, calculus, number theory, topology, statistics, graph theory, logic, recreational mathematics, and other areas.

This dictionary is an indispensable reference for every library that serves teachers and students of mathematics. It is a natural source of information for courses in the history of mathematics and for mathematics courses intended for liberal arts students. At the individual level, whether you are a teacher or a student of mathematics, a lover of words, or hopefully both; whether you are a veteran mathematician or a novice, you will find material in this book appropriate to your level of language and mathematics.

262 pp., Paperbound, 1994

ISBN 0-88385-511-9

List: $27.00 MAA Member: $21.00

Catalog Number WORDS

A Radical Approach to Real Analysis

David M. Bressoud

This book is an undergraduate introduction to real analysis. It can be used as a textbook, as a resource for the instructor who prefers to teach a traditional course, or as a recourse for the student who has been through a traditional course yet still does not understand what real analysis is about and why it was created.

This course of analysis is radical; it returns to the roots of the subject, but it is not a history of analysis. It is designed to be a first encounter with real analysis, laying out its context and motivation in terms of the transition from power series to those that are less predictable, especially Fourier series.

The book begins with Fourier's introduction of trigonometric series and the problems they created for the mathematicians of the early nineteenth century. It follows Cauchy's attempts to establish a firm foundation for calculus, and considers his failures as well as his successes. It culminates with Dirichlet's proof of the validity of the Fourier series expansion and explores some of the counterintuitive results Riemann and Weierstrass were led to as a result of Dirichlet's proof.

To facilitate graphical and numerical investigations, *Mathematica* commands and programs have been included in the exercises. *Mathematica* is powerful and convenient, but any mathematical tool with graphing capabilities—including the graphing calculator—can be substituted.

336 pp., Paperbound, 1994

ISBN 0-88385-701-4

List: $29.00 MAA Member: $22.00

Catalog Number RAN

FREE BOOKS!! See page 38

Cryptology

Albrecht Beutelspacher

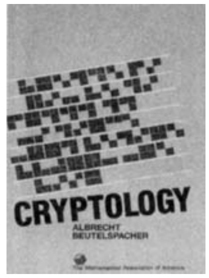
All of cryptology is covered in this work...Occupying a niche in the halls of the ivory tower of pure mathematics for nearly two millennia, number theory now forms a pillar of modern society. This book is the best explanation available today of how that pillar was constructed.

—Charles Ashbacher, Journal of Recreational Mathematics

How can messages be transmitted secretly? How can one guarantee that the message arrives safely in the right hands exactly as it was transmitted? Cryptology—the art and science of "secret writing"—provides ideal methods to solve these problems of data security.

The first half of the book studies and analyzes classical cryptosystems. Here we find Caesar's cipher, the Spartan scytale, the Vigenère cipher, and more. The theory of cipher systems is presented, including a description of the best possible cipher, the one-time pad. An introduction to linear shift registers, which serve as building blocks for most presently used ciphers, is also given.

The second half of the book looks at the exciting new directions of public-key cryptology, which since its invention in



1976, has revolutionized data security. The author also looks at the famous RSA-algorithm, algorithms based on "discrete logarithms," the so-called zero-knowledge algorithms, and the smart cards that bring cryptographic services to the person-on-the-street.

Although the mathematics covered is nontrivial, the book is fun to read, and the author presents the material clearly and simply. Many exercises and references accompany each chapter. The book will appeal to a wide audience including teachers, students, and the interested layperson.

176 pp., Paperbound, 1994

ISBN 0-88385-504-6

List: $26.00 MAA Member: $20.00

Catalog Number CRYPT

Research Issues in Undergraduate Mathematics Learning

Preliminary Analyses and Reports

James J. Kaput and Ed Dubinsky, Editors

Research in undergraduate mathematics education is important for all college and university mathematicians. If our students are to be more successful in understanding mathematics, then college faculty need to understand how mathematics is learned.

This volume of research in undergraduate mathematics education informs us about the nature of student learning in some of the most important topics in the undergraduate curriculum: sets, functions, calculus, statistics, abstract algebra, and problem solving. Paying careful attention to the trouble students have in learning mathematics will help us to work with students so they can deal with those difficulties.

All college faculty should read this book to find how they can help their students learn mathematics.

150 pp., Paperbound, 1994

ISBN 0-88385-090-7

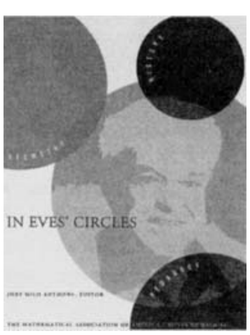
List: $24.00

Catalog Number NTE-33

In Eves' Circles

Joby Milo Anthony, Editor

A very special volume for all of Eves' thousands of admirers. If your interest is history of mathematics, geometry, or pedagogy, then this book is for you.



Howard Eves celebrated his eightieth birthday in 1991. To honor that occasion, the University of Central Florida sponsored a conference that focused on the lifelong interests of this prominent American mathematician, namely, the history of mathematics, the teaching of mathematics, and geometry. Eves is well-known for his contributions to all three areas.

The conference was unique. Conference participants included pre-college mathematics teachers, community college and university teachers, and research mathematicians. Papers were delivered in sessions devoted to the classroom teacher, to the history of mathematics, and to pedagogical and research interests in geometry. Many lectures combined these subjects.

This book presents some of those lectures. Anyone involved with teaching or producing mathematics can find something in this volume that will be interesting to them.

Also included in this volume is a penetrating interview with Eves.

220 pp., 1994, Paperbound

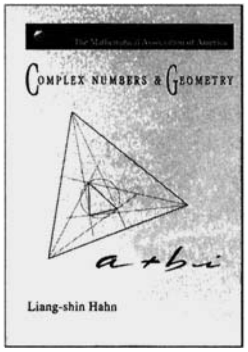
ISBN-0-88385-088-5

List: $24.00

Catalog Number NTE-34

Complex Numbers and Geometry

Liang-shin Hahn



Hahn presents a collection of wonderful proofs of famous theorems. The presentation is of high quality throughout...I have already based a talk for high school mathematics teachers on the proofs from this excellent book.

—Ross Honsberger,
University of Waterloo

Hahn takes beautiful problems on triangles and circles, and shows how to solve them, one after another, with one beautiful trick—complex numbers! Amazing, that in the last two centuries nobody else systematically did plane geometry in this elegant, powerful way.

—Reuben Hersh,
University of New Mexico

This book demonstrates that complex numbers and geometry can be blended together beautifully, resulting in easy proofs and natural generalizations of many theorems in plane geometry—such as the Napoleon theorem, the Ptolemy-Euler theorem, the Simson theorem, and the Morley theorem.

Beginning with a construction of complex numbers, readers are taken on a guided tour that includes something for everyone, even those with advanced degrees in mathematics. Yet, the entire book is accessible to a talented high-school student.

The book is self-contained—no background in complex numbers is assumed—and can be covered at a leisurely pace in a one-semester course. Over 100 exercises are included. The book would be suitable as a text for a geometry course, or for a problem solving seminar, or as enrichment for the student who wants to know more.

202 pp., Paperbound, 1994

ISBN 0-88385-510-0

List: $25.50 MAA Member: $19.50

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EMPLOYMENT OPPORTUNITIES

In Memoriam from page 21

the age of 58. He was an MAA member for 33 years.

Roger Dunn, Mathematician with the U.S. Department of Commerce-NOAA, died on November 8, 1992 at 61. He was an MAA member for 34 years.

W. Emerson Gentzler, retired, York, PA, has died. He was an MAA member for 61 years.

Joseph Gillis, professor emeritus at the Weizman Institute, Israel, died at the age of 82. He was an MAA member for 15 years.

William E. Hartnett, professor at SUNY-Plattsburgh, died on October 14, 1993 at 68. He was an MAA member for 25 years.

Amy Henderson, undergraduate student at Rogers State College, died at the age of 19. She had just recently joined the MAA.

George W. Holmes-Pe, president of Holmes Estimating, Elk Grove, CA, died at the age of 47. He was an MAA member for 3 years.

Carl Holton, retired, Tempe, Arizona, has died. He was an MAA member for 47 years.

Stanley P. Hughart, retired professor, California State University, died at the age of 74. He was an MAA member for 34 years.

Allen R. Hyde, retired, Hawleyville, Connecticut, died at the age of 80. He was an MAA member for 44 years.

Elgy S. Johnson, retired professor at the University of the District of Columbia, died at the age of 81. She was an MAA member for 34 years.

Gladys Jones, retired associate professor at Florida A&M University, died at the age of 73, She was an MAA member for 33 years.

Charles W. Karnes, retired operations resource analyst for the Office of the Secretary of Defense, died at 73. He was an MAA member for 43 years.

Rosalyn S. Lee, professor emeritus, Duquesne University, has died. She was an MAA member for 24 years.

Alan Little, assistant professor at Sam Houston State University, has died. He was an MAA member for 26 years.

George E. Schillinger, associate professor, New England College, died on August 2, 1993 at the age of 55. He was a MAA member for 26 years.

Calendar

National MAA Meetings

August 15-17, 1994 Sixty-ninth Annual Joint Summer Meeting, Minneapolis – MATHFEST 1994

January 4-7, 1995 Seventy-eighth Annual Meeting, San Francisco (Board of Governors, January 3, 1995)

Sectional MAA Meetings

ALLEGHENY MOUNTAIN - April 7-8, 1995 Duquesne University, Pittsburgh, PA

EASTERN PA & DELAWARE - November 5, 1994 Montgomery Co. Community College, Blue Bell, PA

FLORIDA - March 3-4, 1995 Valencia Community College-East Campus, Orlando, FL

ILLINOIS - March 31-April 1, 1995 Monmouth College, Monmouth, IL

INDIANA - October 8, 1994 Indiana University/Purdue University, Indianapolis, IN, and April 1995 University of Northern, Iowa, Cedar Falls, Iowa

INTERMOUNTAIN - April 7-8, 1995 Idaho State University, Pocatello, ID

KENTUCKY - March 31-April 1, 1995 Transylvania University, Lexington, KY

LOUISIANA-MISSISSIPPI - March 3-4, 1995 Mississippi State University, Biloxi, MS

MD-DC-VA - November 11-12, 1994 Western Maryland College, Westminster, MD

METROPOLITAN NEW YORK - May 6, 1995 Manhattan College, Bronx, NY

MICHIGAN - May 5 & 6, 1995 Grand Valley State, University, Allendale, MI

MISSOURI - April 7-8, 1995 Central Missouri State University, Warrensburg, MO

NEBRASKA - April 1995 Creighton University, Omaha, NE

NEW JERSEY - November 19, 1994 Georgian Court College, Lakewood, NJ

NORTHERN CALIFORNIA - October 21-22, 1995 (joint meeting with Southern California Section)

NORTH CENTRAL - October 28-29, 1994 Minot State University, Minot, ND

NORTHEASTERN - November 18-19, 1994 University of Hartford, Hartford, CT

OHIO - October 28-29, 1994 University of Findlay, Findlay, OH

OKLAHOMA-ARKANSAS - March 31-April 1, 1995 Southwestern Oklahoma State University, Weatherford, OK

PACIFIC NORTHWEST - June 15-17, 1995 Whitman College, Walla Walla, WA

ROCKY MOUNTAIN - April 1995 University of Southern Colorado, Pueblo, CO

SEAWAY - November 4-5, 1994 Rochester Inst. of Technology, Rochester, NY

SOUTHERN CALIFORNIA - October 22, 1994 California State University, San Bernardino, CA

SOUTHEASTERN - March 31-April 1, 1995 Univ. of North Carolina-Asheville

SOUTHWESTERN - April 7-8, 1995 University of Texas at El Paso

TEXAS - March 30 - April 1, 1995 Baylor University, Waco, TX

Other Meetings

October 13-15, 1994, Twenty-fourth Annual Conference of the International Society for Exploring Teaching Alternatives, Arizona State University, Tempe, AZ. For more information, contact: Gloria Balderrama, Society Registrar, Mathematics Department, Colorado State University, Fort Collins, CO 80523; (303) 491-6452; FAX: (303) 491-2161; e-mail: gloria@ math.colostate.edu.

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