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# FOCUS

THE NEWSLETTER OF THE MATHEMATICAL ASSOCIATION OF AMERICA

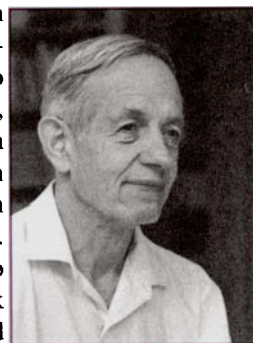
## Mathematician Awarded Nobel Prize

*Keith Devlin*

The awarding of the Nobel Prize in economics to the American John Nash on October 11th meant that for the first time in the 93-year history of the Nobel Prizes, the prize was awarded for work in pure mathematics.

When the Swedish chemist, engineer, and philanthropist Alfred Bernhard Nobel established the awards in 1901, he stipulated chemistry, physics, physiology and medicine, and literature, but did not create a prize for mathematics. It has been rumored that a particularly bad experience in mathematics at high school led to this exclusion of the "queen of sciences", or it may simply be that Nobel felt that mathematics was not, in itself, of sufficient relevance to human development to warrant its own award. Whatever the reason, the mathematicians have had to make do with their own special prize, the Fields Medal, though this differs significantly from the Nobel Prize by being restricted to mathematicians who are less than 40 years of age.

It was the application of Nash's work in economic theory that led to his recent Nobel Prize, which he shares with fellow American John Harsanyi and German Reinhard Selten. Nash's contribution to the combined work which won the award was in game theory.



Nash's key idea—known nowadays as Nash equilibrium—was developed in his Ph.D. thesis submitted to the Princeton University Mathematics Department in 1950, when Nash was just 22 years old. The thesis had taken him a mere two years to complete. He had received both his B.S. and M.S. degrees in an equally rapid three-year period starting in 1945 and fin-

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## Growing Optimism that Fermat's Last Theorem has been Solved at Last

*Keith Devlin*

Hopes rose dramatically in late October that Fermat's Last Theorem might have been solved at last, when, on October 25th, Princeton mathematician Andrew Wiles released two manuscripts claiming to prove the result. The first of these papers, a long one titled "Modular elliptic curves and Fermat's Last Theorem", contains the bulk of Wiles' argument. The second paper, titled "Ring theoretic properties of certain Hecke algebras", was written jointly by Wiles and a colleague, Richard Taylor, and provides a key step Wiles uses in his proof.

The new announcement came just over a year after Wiles made his initial dramatic announcement that he had solved Fermat's 350-year

old problem. On June 23, 1993, speaking to a packed audience at a mathematics conference at Cambridge University's Newton Institute, Wiles had outlined a proof of a technical result about elliptic curves (a special case of the Shimura-Taniyama Conjecture), and claimed that this result implied Fermat's Last Theorem as a consequence. The connection between the full version of the Shimura-Taniyama Conjecture and Fermat's Last Theorem had been established by Kenneth Ribet of UC Berkeley in 1986.

Though the bulk of Wiles' enormously complex proof was agreed to have been correct, within a few weeks a significant mistake was discovered in the part of the argument that led to the Last Theorem itself.

See *Fermat* on page 3

**You've been good this year. Give yourself a treat! See page 30**

# FOCUS

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# Editorial

## The Calculus Ultrafilter

In September, William Dunham and I were the guests on National Public Radio's *Talk of the Nation*, an hour-long talk show with listener phone-ins. The event that occasioned NPR to devote an entire show to mathematics was the publication in the late summer of our two most recent books, Dunham's *The Mathematical Universe* (Wiley) and my own *Mathematics: The Science of Patterns* (W. H. Freeman, Scientific American Library).

One of the phone-in comments came from a listener in California—Jim, I believe his name was—who suggested that high schools spend far too much time teaching students calculus, and that the time might be better spent providing instruction in other subjects. Radio being the medium it is, the responses Bill and I gave led the conversation in the direction of the ubiquity of mathematics, and then the host moved us on to other matters. We never did get a chance to come back to what I think is a particularly important matter. The plain truth is I agree with the listener. I think schools do spend too much time, far too much time, teaching calculus. Come to that, I think colleges and universities spend too much time teaching calculus as well.

In fact, I did begin my response by saying I thought the listener's point had some validity, but I quickly thought better of following up on the matter when I realized that I could not possibly make my case adequately in the 'sound bite' form of a radio talk show. When treading on sacred and hallowed ground, one should tread slowly and warily. And the world of mathematics knows no ground more hallowed than the teaching of calculus.

I guess it is time I defined my terms. By 'teaching calculus' I (and presumably the listener from California) mean the kind of activity that, judging from the results it produces, concentrates on developing in the student the ability to differentiate and integrate lots of functions. In nearly 25 years of college and university mathematics teaching, I have encountered scores and scores of students who had become quite expert in performing this task. Just over halfway through that 25 year period, I started asking those highly proficient differentiators and integrators to explain to me, in as simple a fashion as they could, just *what* the processes of differentiation and integration actually are, and what exactly *are* those things called functions that these two processes appear to act upon.

If you have ever tried this, you will surely not be surprised when I say that I almost never received an answer that indicated any real understanding on the part of the student. Sure, some could give the standard limit definitions, but they clearly did not understand the definitions—and it would be a remarkable student who did, since it took mathematicians a couple of thousand years to sort out the notion of a limit, and I think most of us who call ourselves professional mathematicians really only understand it when we start to teach the stuff, either in graduate school or beyond. But I was not looking for a regurgitation of a formal definition. What I wanted was some sense of what the calculus is all about. Why was it invented? What were the basic intuitions that Newton and Leibniz drew on in order to arrive at the notion of (what we now call) differentiation? Why was it necessary to develop an elaborate *calculus*, a battery of techniques to compute derivatives and integrals? What did they think of the fundamental theorem of calculus, and why was that result so important?

Having students who graduate from high school, or college for that matter, without being able to differentiate or integrate does not bother me—especially since computers can do the whole job faster and more reliably than people. But having students graduate without a sense of what the calculus is *about* bothers me greatly. The invention of the calculus was an enormously significant event in the history of humankind, having ramifications that affected most aspects of our lives in one way or another. We fail our students badly if we do not convey to them some sense of that giant leap for mankind. A few will need to know the *how* of calculus, and that need can be handled when it arises. In contrast, I think all should be aware of the *what* and the *why*.

For me, the present, sorry situation is summed up by a remark made to me by a senior colleague at my college, with whom I was speaking shortly after the radio broadcast. Striving to find a way to convey the fundamental idea of the differential calculus in a one-minute sound bite, I had likened it to a movie film, where the effect of continuous motion is achieved by the sufficiently rapid sequencing of a series of still pictures. My colleague, an accomplished economist who had taken plenty of calculus courses in his time, said that it was only when he heard me make that remark that he finally had any inkling of just what the whole thing was about. He had, you see, been taught the how, but no one had even tried to explain the what and the why. Like the vast majority of students, calculus had been presented to him as a large collection of mysterious procedures, whose invention could only have come from a mind very different from the rest of humanity. In his case, that had been over thirty years ago. But as far as I can see, things have not changed very much since then. I think they should.

—Keith Devlin

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

## Secretary's Report

*G. L. Alexanderson*

The Board of Governors met in Minneapolis, Minnesota, on August 14, 1994. The following is a report of actions taken.

A new Hedrick Lecturer was confirmed by the Board: our First Vice-President, Doris Schattschneider, of Moravian College. She will be the Hedrick Lecturer for the MathFest in Burlington, Vermont, August 1995.

The Board elected Professor Paul Zorn of St. Olaf College to be the successor of Professor Martha Siegel as editor of *Mathematics Magazine*. Professor Zorn's five-year term as editor will begin in January 1996.

The Board elected a Nominating Com-

*Fermat* from page 1

Part of the reason why mathematicians were so ready to give Wiles the benefit of the doubt when he made his original June 1993 announcement was that his track record was so good. He was not prone to jumping to conclusions. Moreover, the new techniques he had developed clearly represented a major advance that stood a high chance of working. True to his known caution, Wiles refused to release a copy of his manuscript. He wanted to wait until it had been thoroughly combed for hidden errors by a small number of close colleagues.

His caution proved well founded when one of the inevitable number of small errors turned out to be not so small after all.

Given Wiles' previous caution, his decision to release his work leads to increased confidence that this time, he is probably right. The newly released manuscript was circulating privately among a small number of experts for several weeks before Wiles released it, and the inside word is that it looks good. In an e-mail message broadcast over the Internet on October 25th, number theorist Karl Rubin of the Ohio State University said, "While it is wise to be cautious for a little while longer, there is certainly reason for optimism."

The overall outline of the argument Wiles has just released is broadly similar to the one he described in Cambridge.

mittee to construct slates of candidates for President-Elect, and the two Vice-Presidents for the 1995 election. Elected were Lida K. Barrett, John H. Ewing, Raymond L. Johnson, Sharon C. Ross, and Alan C. Tucker (chair).

On recommendation of the Committee on the Edyth May Sliffe Awards, a new set of awards was added to honor junior high school teachers. Up to now Sliffe Awards were awarded only to teachers in senior high schools. In addition the Board approved a new prize for outstanding research in mathematics by an undergraduate. The prize will be awarded jointly with the American Mathematical Society.

The Board passed a resolution of congratulations to Professor Dirk J. Struik for the occasion of his one-hundredth birthday, September 30, 1994.

## Institute in the History of Mathematics and its Use in Teaching

Would you like to teach a course in the history of mathematics? Does your college or university plan to offer such a course soon for prospective teachers to implement the recommendations of the MAA, NCTM and NCATE? Do you want to learn how the history of mathematics will help you in teaching other mathematics courses?

If you answered "yes" to any of these questions, you are invited to apply to attend an MAA Institute in the History of Mathematics and Its Use in Teaching. The MAA expects to receive funding for this institute, which will take place at American University, Washington, DC, June 5–23, 1995, and for three additional weeks in June 1996, with work continuing through an electronic network during the academic year 1995–96. The teaching staff will consist of well-known historians of mathematics, including, in the first year, V. Frederick Rickey, Victor J. Katz, Steven H. Schot, Ronald Calinger, Judith Grabiner, and Helena Pycior. Activities at the institute will include reading of original sources, survey lectures, small group projects, field trips to three great libraries, and discussions of methods of conducting a history of mathematics course. Participants will be prepared to make presentations on their work at the Joint Mathematics Meetings.

Applications are strongly encouraged from faculty teaching at small institutions, at minority-serving institutions, and institutions that prepare secondary teachers. Facilities at American University are fully accessible. Dormitory space for families of participants is available.

For more information and application forms, write to V. Frederick Rickey, Mathematical Association of America, 1529 Eighteenth St., N.W., Washington, DC 20036-1385, or contact him by e-mail at [rickey@maa.org](mailto:rickey@maa.org). Completed applications will be due by March 15th and applicants will be notified of their acceptance by early April.

*(Note: This institute will be conducted subject to the MAA receiving funding.)*

## Joint Mathematics Meetings Update

### AMS-MAA Session

Panelists for the session *You're the professor, what next?* on Friday morning include Kenneth P. Bogart (Dartmouth College), Donald W. Bushaw (Washington State University), Daniel L. Goroff (Harvard University), Edward P. Merkes (University of Cincinnati), Robert R. Phelps (University of Washington), Richard D. Ringeisen (Old Dominion University), Stephen Rodi (Austin Community College), Ivar Stakgold, (University of Delaware), and Guido L. Weiss (Washington University, St. Louis).

### AMS Session

The Committee on Science Policy panel discussion on Friday at 3:15 P.M. is titled *Is there a better way to support mathematics?: A comparative view*. Panelists from the U.S., Canada, and Europe will describe systems of support in their countries, what they see as the best and worst aspects of those systems, and how they relate to the current U.S. system.

### MAA Session

The contributed paper session on *Recruitment and retention of women faculty* is sponsored by the MAA Committee on the Participation of Women, not the Joint Committee on Women in the Mathematical Sciences.

### Activities of Other Organizations

The title of the Association for Women in Mathematics' Noether Lecture given by Judith D. Sally on Thursday morning is *Measuring Noetherian Rings*.

The title of the AWM panel discussion on Wednesday afternoon is *AWM: Why do we need it now?* The National Association of Mathematicians' Claytor Lecturer is James H. Curry (University of Colorado, Boulder), who will speak on Saturday afternoon on *Endomorphisms and factorization of polynomials*.

NAM's Cox-Talbot Address will be given on Friday evening by William A. Hawkins, Jr. (University of the District of Columbia, and the MAA), on *Some perspectives about mathematics and underrepresented American minorities*.

The Mathematicians and Education Reform Network (MER) banquet is on Thursday evening at 6:30 P.M., not on Wednesday evening.

The MAA panel discussion, *Forum on the mathematical preparation of K-6 teachers* on Thursday morning includes Judith Roitman (University of Kansas) as moderator; Mercedes A. McGowan (William Rainey Harper College), and Paul R. Trafton (University of Northern Iowa) as presenters; and Jerry L. Bona (Pennsyl-

vania State University), Marilyn E. Mays (North Lake College), and Alan C. Tucker (SUNY at Stony Brook) as respondents.

The MAA panel discussion on the *Mathematical preparation of the technical work force* on Thursday morning also includes Bruce Jacobs (Peralta Community College District) as a panelist.

From noon to 1:00 P.M. on Thursday there will be an MAA Northern California Section business meeting and election of section vice-chair.

The AMS Committee on Education will sponsor a panel discussion on Saturday morning, *Can we evaluate teaching or research in the mathematical sciences?* Recent reports urge departments to give more weight to teaching in evaluating faculty. Many argue that this makes no sense since it is impossible to evaluate teaching. Others counter that it is just as difficult to evaluate research, but somehow we do it. This panel, organized by Ronald G. Douglas (SUNY at Stony Brook and chair of the AMS Committee on Education), will provide a range of views on the problems of evaluating teaching and research in the mathematical sciences. Panelists are William P. Thurston (Mathematical Sciences Research Institute), D. J. Lewis (University of Michigan), and Alan H. Schoenfeld (University of California, Berkeley).

The MAA session *Shaping up: Expectations for high school mathematics* on Saturday afternoon includes Hyman Bass (Columbia University) as moderator; and Richard Askey (University of Wisconsin, Madison); Gail Burrill (Whitnall High School, Wisconsin); Wade Ellis (West Point and West Valley College); and A. Wayne Roberts (Macalester College), as panelists.

There will be an MAA poster session on *Research by undergraduate students* on Saturday from 3:00 P.M. to 5:00 P.M. sponsored by the CUPM Subcommittee on Undergraduate Research in Mathematics, the Mathematical and Computer Science Division of the Council on Undergraduate Research, and the Committee on Student Chapters. Posters are invited which describe either mathematical research projects of individual undergraduate students or the way in which undergraduate research is organized and encouraged at a given institution. Prospective exhibitors should contact John Greever (Harvey Mudd College).

## Undergraduate Research Prize Announced

The American Mathematical Society and the Mathematical Association of America have established the joint Prize for Outstanding Research in Mathematics by an Undergraduate Student.

The prize is to be awarded to an undergraduate student (or students having submitted joint work) for outstanding research in mathematics. Any student who is an undergraduate in a college or university in the United States or its possessions, Canada, or Mexico, is eligible to be considered for this prize of \$1000 and a certificate. A few honorable mentions may be made, for which a certificate is awarded.

The prize research need not be confined to a single paper; it may be contained in several papers. The paper, or papers, to be considered must be submitted while the student is an undergraduate; research paper(s) cannot be submitted after a student's graduation. Publication of the research is not required.

The research paper, or papers, may be submitted for consideration by the student or by a nominator. All submissions for the prize must include at least one letter of support from a person familiar with the student's research, usually a faculty member.

This year's prize will be awarded for papers submitted no later than June 30, 1995. Papers to be considered for this prize should be sent together with supporting materials to Professor Robert M. Fossum, Secretary, American Mathematical Society, Dept of Math, University of Illinois, 1409 W Green St, Urbana, IL 61801.

*Nobel Prize from page 1*

ishing in 1948, at the Carnegie Institute of Technology (now called Carnegie Mellon University). The thesis was titled “Non-cooperative Games”.

A short version of Nash’s Ph.D. thesis appeared as an announcement in the *Proceedings of the National Academy of Sciences* in 1950; that version, with a one-page proof, was titled “Equilibrium points-in  $n$ -person games”. A reworked version of the entire thesis was published in *Annals of Mathematics* in 1951, with the title “Non-cooperative Games”.

In his thesis, Nash used Brouwer’s fixed point theorem (1926) to prove the existence of an equilibrium point. Both the *Proceedings* announcement and the *Annals* version use the more general Kakutani’s Fixed Point Theorem (1946) in place of Brouwer. Nash credits this simplification of the proof to a suggestion by David Gale, now professor emeritus of mathematics at the University of California, Berkeley, then a graduate student in mathematics at Princeton.

Game theory—the abstract study of games (draughts, chess, poker, and so forth)—becomes relevant to the more serious aspects of life when its results are applied in warfare, political conflict, or economic competition. The game theorist examines the strategies the players in such a “game” may adopt.

A pure strategy in a game is a complete plan for every possible situation that the player might encounter during the course of play. When the pure strategies of all players are submitted to an umpire, the entire course of play and the payoffs to the players are determined.

However, not all games can be solved with pure strategies, and players must then use a mix of pure strategies by choosing the probabilities with which each pure strategy is played. For example, in the simple game where two players simultaneously put down a penny, with one player winning if they both match (both heads or both tails) and the other winning otherwise, the pure strategies are “heads” or “tails” and the mixed strategies are the random frequencies with which a player chooses to play these pure strategies.

In his thesis, Nash proved that in any game there exists at least one set of mixed strategies, with one for each player—a so-called Nash-equilibrium point—such that no player can improve his or her position by changing strategy. At a Nash-equilibrium point no one can improve his or her position, and adoption of those mixed strategies results in a stable situation.

Nash used methods from topology to prove the existence of an equilibrium point. His result applies to any finite, non-cooperative game involving any number of players. (The word “finite” here refers to the fact that the number of possible strategies is limited; “non-cooperative” means that no communication between players may take place, and no alliances may be formed.)

Game theory began to be applied in economics following the publication of the book *Theory of Games and Economic Behavior* by John von Neumann and Oskar Morgenstern in 1944. Their analysis was largely limited to games involving only two players. Nash’s proof of the existence of at least one equilibrium point in the much wider class of non-cooperative games with any number of players has had a major impact on modern economic theory. If you think of economic behavior as a game in which there are well-defined rules, and all the players try to maximize their payoffs, then in general it will be possible for any given player to improve his or her position by changing strategy. Consequently, players will keep changing their strategies until they reach a Nash-equilibrium point at which no player can improve his or her position. In some cases, this analysis makes it possible to predict the likely strategies that economic actors will adopt in the long run—namely, those at a Nash-equilibrium point at which no player can change to improve his or her outcome.

An illustration of Nash’s notion of an equilibrium point that has a perplexing twist in its tail is provided by the so-called “Prisoner’s Dilemma” devised by Nash’s advisor at Princeton, mathematician Albert Tucker, a topologist turned game theorist. Tucker created the paradox in 1950, the same year Nash wrote his thesis.

The Prisoner’s Dilemma asks us to imagine a scenario where two suspects are

caught by the police, and, during the course of separate interrogations, are offered the following choice. If one confesses and the other does not, the confessor goes free and the other goes to jail for a long sentence; if neither confesses, each goes to jail for a short time; if both confess, each receives an intermediate jail sentence.

Each reasons that he is better off confessing because if the other confesses, he receives an intermediate sentence by confessing and a long sentence by not confessing; if the other does not confess, he goes free by confessing and receives a short sentence by not confessing. Since each reasons this way, each confesses, and so each is given an intermediate sentence.

The strategy whereby both confess is the Nash equilibrium in the game because neither can improve his position by changing his strategy (because to renege on confessing means jail for a long time).

What seems paradoxical about this situation is that, if both suspects continue to protest their innocence, they would both receive a short sentence. And yet, common sense logic compels them both to confess and end up spending longer time behind bars.

Born in West Virginia in 1928, Nash was appointed research assistant and instructor at Princeton in 1950, and worked as a consultant for the Rand Corporation during the summers of 1950 and 1952. In 1951 he was appointed a Moore Instructor at the Massachusetts Institute of Technology, where he was promoted to assistant professor in 1953 and to associate professor in 1957. In 1956–57, 1961–62, and 1963–64, he was a visiting member at the Institute for Advanced Study. After resigning his professorship at MIT in 1959, he was a research associate there in 1966–67.

Since the mid-1960s, Nash has lived in the Princeton area. As a visiting research collaborator in the Mathematics Department, he makes use of computing and library facilities in order to carry out his own program of independent research.

Nash is a recipient of the von Neumann Theory Prize from the Operations Research Society of America, and is a fellow of the Econometric Society.

# Search Committee Diary

*Edward F. Aboufadel*

*The search continues for the perfect math instructor. In this episode, our diarist begins his ascent, then breathes deeply through a grueling schedule of interviews at the ER in Cincinnati. Intrepidly he struggles to find that Yes among Maybes and Nos as the number of applications climbs to over three hundred! Watch your step...*

I read, much of the night, and go south in the winter.

T. S. Eliot  
"The Burial of the Dead"  
*The Waste Land*

The greatest misfortune that ever befell man was the invention of printing. Printing has destroyed education.

Benjamin Disraeli  
*Lothair*

**December 4, 1993:** Today I began reading the application folders. I read through fifteen of them in about ninety minutes. At that rate, if we were to receive one thousand applications, I would spend one hundred hours reading through them. Let's hope we don't get that many.

What can I say about the folders I read? It was very interesting. At the risk of sounding like a form rejection letter, let me say that there are a lot of accomplished people out there. Some have very impressive research backgrounds, while others have a lot of teaching experience.

With approximately twelve pieces of paper per candidate in hand, I have to grade these candidates as Yes, Maybe, or No. (Again, the question I am trying to answer is, "Should we interview this person?") Twelve pieces of paper can actually tell you a lot. You get a sense of where a candidate's priorities are from what is sent.

When it comes to applying for jobs, there is one approach—the scattershot approach—for which we young (and not so young) mathematicians have become famous. This approach is to take advantage of computers and copy machines and to apply for any position that comes along. It is clear to me that some of our candidates

have done this, since many have little to say about the fact that one of the responsibilities of the position, as stated in the advertisement, is to supervise secondary school student teachers. Silence on this topic is, of course, not the kiss of death as far as I am concerned, and perhaps when I am done reading all of the folders, I'll discover that practically no one has anything to say about supervising secondary school student teachers. After all, it is not a common responsibility in academia, although it is an important one.

**December 14, 1993:** The big Reading of the Applications continues. I have come across two applicants so far that I think are promising, and I wonder if the other members of the search committee will feel the same way that I do. I guess I will find out next Tuesday.

This week we are sending out our flyer to mathematics education departments that we have on a list. Our ad was in FOCUS last week, and it is also now available on e-MATH, so by now people should know about our position. That, in fact, seems to be the case, as during the past few days we have been averaging twenty to twenty-five new applications per day. (The count on Friday was 107, so we must be closing in on 150 as of this writing.) Perhaps with the semester ending, people are finding more time to send letters out.

I talked to our secretary today to see how she is dealing with the flood of mail to the search committee. She is spending practically her whole working day processing applications. In the mornings, she finishes dealing with the previous days' bids for our position, which includes sorting out the documents and preparing the "we've received your application" form letters. The new mail comes in around noon, and then she starts over again. Our secretary has an undergraduate assistant who helps her a few afternoons a week. I suggested that we should hire another undergraduate just for the month of December to help us with these applications, but our secretary just laughed that sardonic laugh of someone who has worked at an institution long enough to know.

Apparently a few of our intrepid applicants view our hiring contest as some sort of lottery and have applied twice, I suppose to increase their odds. So far none of these wily folk have slipped past our

secretary's watchful eyes.

As a final touch, our secretary saves the cancelled stamps from the applicants' envelopes and sends them to a convalescent home. The home is somehow able to raise money from the cancelled stamps. Graduate students take note!

*Polonius.* What do you read, my lord?  
*Hamlet.* Words, words, words.  
Shakespeare's *Hamlet*

**December 20, 1993:** Working an hour or two a day, I have now read through 167 application folders. Some are complete, while others are missing letters of recommendation, but I am getting the gist of the quality of our applicants. Of the 167 applications, I have ranked about a fourth of them as either a Yes or a Maybe.

It is interesting to see the many ways that schools send out letters of recommendation. At some schools, there seems to be an office which coordinates the sending of the letters, so for some applicants, we have received just one envelope with all three letters in it. These packets often include a page that states that the applicant has waived his or her rights to see the letters. For other applicants, the letters come in one at a time, and we have applicants that have only one letter of recommendation, while others have two or three. A few have eight or nine. In our advertisement, we asked for three.

There are two types of recommendation letters. There are the "wonderful research" letters and the "wonderful teaching" letters. A colleague of mine tells me that ten years ago the letters were more balanced. Concerning the "wonderful teacher" letters, it troubles me a bit that practically every one of our candidates is either "an exceptional teacher," "an effective teacher," "an excellent teacher," "an exemplary teacher," "a tremendous teacher," "an accomplished teacher," "the best T.A. who ever worked for me" or "in the top 25% of the T.A.s at Whatchamacallit U." Judging from these letters of recommendation, I start to wonder why people think there is a crisis in undergraduate mathematics education. ("Maybe it is because the extraordinary teachers need to spend too much time looking for jobs," our diarist says sarcastically.)

Tomorrow morning at 8:00 A.M., the com-

mittee meets to trade opinions about these applicants. Our goal is to come up with a list of people we would like to interview in Cincinnati (if those people are at the Joint Mathematics Meetings, of course).

**December 21, 1993:** As I awoke this morning, a tropical storm was blowing through Connecticut. It was windy, rainy, and mild. I fought the storm, walking from my car to Engleman Hall. A few minutes later, we started our meeting.

For an hour and a half, we compiled our "votes" on individual applicants. When all was done, we had a list of about thirty applicants that we will be looking for in Cincinnati. (I'll call this group our quarterfinalists, and we will add to this list after the holidays.) Many of the job seekers pointed out in the cover letters that they would be at the winter meetings, and most of those said that they would be enrolled in the Employment Register. We will see what happens next month.

It is premature for us to send out rejection letters. Most applicants' files are incomplete. We've decided to contact some of our leading candidates to remind them to send the rest of their documents in. (Letters of recommendation, in particular, can be slow in coming.)

Tomorrow I am driving west to see my parents, brother, and niece for a few weeks, and then I am driving to Cincinnati. The other committee members who are going to Cincinnati are flying in, so I'm in charge of bringing the various catalogs and flyers that we will be giving to our interviewees at the Employment Register. When we all get to Cincinnati, we will meet up with the committee chair who will coordinate our activities there. Happy Holidays!

**January 13, 1994:** Thursday morning. I have arrived in Cincinnati, and the Joint Mathematics Meetings are well underway. The marquee on the Cincinnati Convention Center announces simply, "Welcome Mathematicians."

Three members of our search committee are here, including myself, and we met yesterday afternoon to get organized for the Employment Register (ER). Over five hundred people have registered this year as applicants in the ER. Our first task was to choose as many as twenty of these people for our interview request list. Before we met, each of us had looked over the book

of resumes of applicants that is provided by the ER, so each of us had a short list of numbers to contribute. We combined these lists together into our List of Potentials.

Next we took out our list of quarterfinalists that we developed last month to see which of them were participating in the ER. We found that eight out of our list of thirty quarterfinalists were participating. Surprisingly there were a few of those eight who were not on our List of Potentials. We figured that this was due to the limitations of the ER resume form. With the addition of these people and a few on-site applicants, our List of Potentials grew to thirty members.

Employers are allowed up to twenty requests, so we had to cut some of the thirty. To do this we went through the resumes one by one, exercising less generosity in our judgments than we did initially. When the smoke cleared, we had actually reduced our List of Potentials to seventeen, and we submitted that list to the ER.

Next we decided on a schedule for the interviewers. Sometimes we will have two interviewers, sometimes just one. I will be interviewing for all of the Thursday afternoon time slots and a few of the Friday afternoon slots.

Participating in the ER takes a lot of time. Our Wednesday afternoon meeting alone lasted ninety minutes. I am not getting to as many sessions as I have in past winter meetings.

I'm observing that, as in past years, some applicants are leaving notes in the employers' message boxes, requesting interviews outside of the ER. Related to this is the atmosphere of anxiety among the appli-

cants as they worry about their futures.

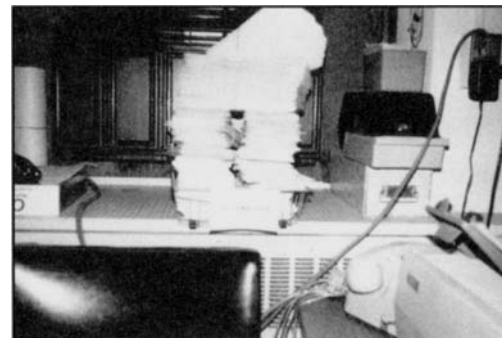
There are also some new wrinkles in the job market this year. I hear that more schools are using e-mail to handle applications and rejections. One friend told me that he had already received a few e-mail rejections.

In the ER, at least one school yesterday sought to discourage certain applicants from requesting an interview with that school. To those people who had already sent the school an application and whom the school had put on the Probably Not list, this school sent notes reminding those people of their low status in the process and strongly suggesting that they not request an interview with that school. This is probably not a bad idea, provided that the note was a reminder and not an initial announcement.

This morning the chair picked up our interview schedule. Sixteen of our seventeen requests were met. Of the sixteen, seven were mutual requests, which means that the applicant also requested us. The other twenty-four interviews will be with people that we did not request, but who requested us. Of those twenty-four, nine labelled Southern Connecticut a "high-priority" request.

Finally the chair informed me yesterday that since Christmas, the number of applications for our position doubled. We now have over three hundred applicants. I have a lot of reading to do when I get back to Southern next week.

**January 15, 1994:** Saturday night. Late yesterday afternoon we completed our forty interviews. I participated in fourteen of them. For a few of them, I was the lone interviewer. When I worked with someone else, I was the lead questioner about half of the time.



Left: Coming in... 500 application files  
Above: Going out... letters of rejection

Each interview was fifteen minutes long, and a typical interview went something like this:

At the beginning, we gave the applicant a copy of the job announcement and the one-page description of Southern Connecticut State University that I wrote before Christmas. Often, but not always, the applicant would give us a vita that we could refer to during the interview. This was helpful.

We then said to the interviewee something like, "In our department we have approximately eighty mathematics majors. Many are in the Applied Mathematics program, a few are pursuing B.A. degrees in mathematics, but the majority is seeking the B.S. in mathematics with secondary education teaching certification." (If someone wants to teach high school mathematics and wants certification from us, we require that the person earn a B.S. in mathematics. Some other schools do not do this, but I think it is a sound idea.)

We continue: "This position has many responsibilities, the primary one being to supervise these certification students, particularly when they are doing their student teaching. What kind of background do you have in secondary education that would relate to this responsibility?" (We are rather lucky to have a position unusual enough that we can quickly get to the point. I wonder how it would work if we were looking for an Applied Math person? I would hope we could develop a pointed question or two to ask at the ER.)

There were many different responses to the question. If the applicant had some background in secondary education (e.g., used to be a high school mathematics teacher; received certification in some state; was involved in a program in graduate school that included high school teachers), then we asked probing questions about these activities. We might have asked, "What teaching methods did you use in your classes?" or, "What do you know about the NCTM Standards?" or, "What is your opinion of the Standards?"

Another responsibility of the position is to teach undergraduate mathematics courses, so we asked the interviewees which classes they believe they could teach. We asked about their college teaching experience and about their use of technology in the classroom. We did not

have much time to discuss their dissertation work.

If there was any time left, we often asked the applicant if he or she had any questions of us. A few asked about the cost of living in Connecticut.

Now, some of the applicants were clearly not suited for the job. I asked other committee members whether or not we should just tell these people right then and there not to expect a call from us, but it was felt that this should be a committee decision

and not just the decision of the interviewers. On the other end of the spectrum, we couldn't express too much enthusiasm to promising candidates, pretty much for the same reason.

Next week the committee will meet to sort out our impressions of the interviewees.

Interviewers (including myself) commented that after several interviews, it was hard to remember if a certain question had

See *Committee Diary* on page 15

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# Gardner on Gardner: JPBM Communications Award Presentation

In the summer of 1994, the Joint Policy Board for Mathematics presented its Communications Award to Martin Gardner at his home in Hendersonville, North Carolina. Conferring the award was Professor Bob Fennell, chair of the Department of Mathematical Sciences at Clemson University. Following are excerpts of their conversation.

**Bob Fennell:** Martin, I've admired your books and articles for many years. And on behalf of the Joint Policy Board for Mathematics, it's my sincere pleasure to be here to present this Communications Award to you for your books and articles on the theory of mathematics and clear communication of ideas. We have a certificate and a check for \$1,000 to present to you. The certificate reads, "American Mathematical Society, Mathematical Association of America, and Society for Industrial and Applied Mathematics grants this, The Joint Policy Board for Mathematics Communications Award, to Martin Gardner in recognition of exceptional creativity and sustained contributions in communicating mathematics in numerous books and articles, and in the 'Mathematical Games' column in *Scientific American*." I present this to you and congratulate you.

**Martin Gardner:** Well, thank you very much. Thank you.

**Fennell:** Martin, you've been very successful in communicating the power and beauty of mathematics to the general public. I'd like to ask you why you think you've been so successful.

**Gardner:** Well, thank you very much. I've said before, and I'll say it again, that if you write about mathematics for the public, popular writing on mathematics, it's good not to know too much about mathematics, and I think that's one of the secrets of the kind of writing that I do. I know mathematics only up to a certain level, and beyond that it's very difficult for me to understand. I have to work so hard to understand anything that I'm writing about, that it makes it easier for me to explain it perhaps in a way that the general public can understand. I am not a mathematician in any creative sense of the word. I love mathematics and I enjoy writing about it, but I don't like to pose as a genuine math-

ematician, more a journalist of mathematics.

Mathematics has its own peculiar beauty, and that's about all I can say about it—the fact that it all works out so rationally and so beautifully. There's something eerie about the way mathematical proofs work out, and that's always intrigued me. Ever since I was in high school I've been fond of mathematics, but strictly as an amateur. Actually, I majored in philosophy at the University of Chicago and I had the privilege of taking a seminar from the great Rudolph Carnap, and that was the most exciting course I think I ever took, so one of my main interests is in the philosophy of science.

**Fennell:** Martin, you have no formal college training in mathematics. How did you chose writing mathematics to be your career?

**Gardner:** Actually, I got into writing about mathematics quite by accident. I did an article for *Scientific American* on hexaflexagons in 1957. I had heard about hexaflexagons from friends of mine in the magic community. They were playing around with these strange objects and, as you know, the great Feynman, Richard Feynman, was one of the coinventors of hexaflexagons, so it made an interesting story. Gerry Piel, who was at that time the publisher of *Scientific American*, called me into his office after they had bought this article and asked me if there was enough similar material like this around to make a column. I said I thought there was. So I rushed around New York to the old bookstores and bought as many books on mathematics as I could, especially in the recreational field. The next month the column started under the title "Mathematical Games." So that's how I began. I have to thank Gerry Piel for that. Up until then, I had never written anything about mathematics.



Most mathematicians find it very hard to write for the general public, they're on such a high level that they can't bring it down to where non-mathematicians can understand it. I can't imagine, Paul Erdős, for example, writing a popular article on number theory.

**Fennell:** Do you think there's a place for using recreational mathematics in the classroom?

**Gardner:** I've always thought that the best way to get students interested in mathematics is to give them something that has a recreational flavor: a puzzle, a magic trick, a paradox, or something like that. I think that hooks their interest faster than anything else. I recall when I was taking geometry in high school in Tulsa, I had finished doing the work and I was playing around with trying to figure out how to win a game of tic-tac-toe, and I was playing around with a pencil and a sheet of paper, and the geometry teacher came around and saw what I was doing. She snatched the paper away and said, "When you're in my class, I want you to work on mathematics and nothing else." That's always amused me because I think teaching children aspects of tic-tac-toe is a wonderful way to introduce them to combinatorial geometry, number theory, game theory, all kinds of things. Just that simple little game leads them into very significant areas of mathematics.

**Fennell:** Well, we've talked a lot about mathematics and recreational mathematics and all your interests. Would you like to comment on where you think mathematics fits in the real scheme of things?

**Gardner:** Mathematics is not only real, but it is the only reality. That is that the

See *Gardner* on page 33

# Networks in FOCUS

## Gopher and the Mathematics Archives: Part Two

Earl D. Fife & Lawrence Husch

The first part of this article appeared in the previous issue of FOCUS. Note that because information is continually being added to the Mathematics Archives, by the time this is printed, the menus may have additional or somewhat modified entries.

As mentioned in part one of this article, there are several differences between what happens for the Macintosh user and for the DOS or UNIX user. We observed a cosmetic difference with the interface using icons rather than text. Another way the interface differs is that unless otherwise instructed, each selection generates a new window, so moving to earlier selections is just a matter of choosing an appropriate window. (There is also a pull-

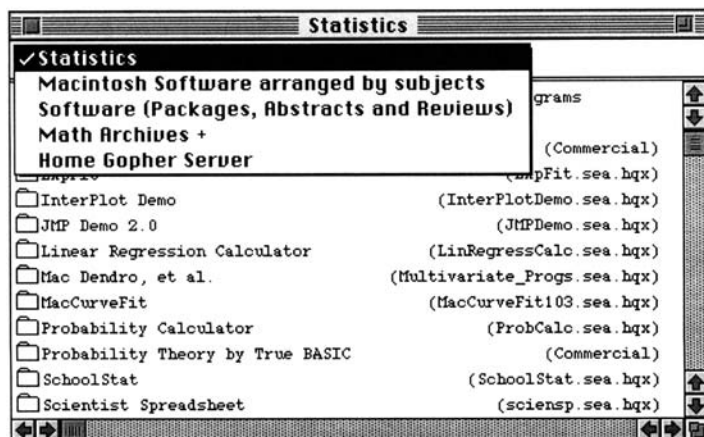
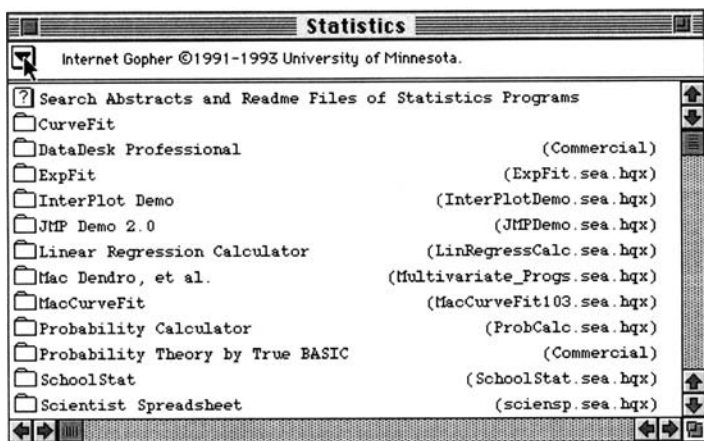


Figure 14: Using the Pull-Down Menu

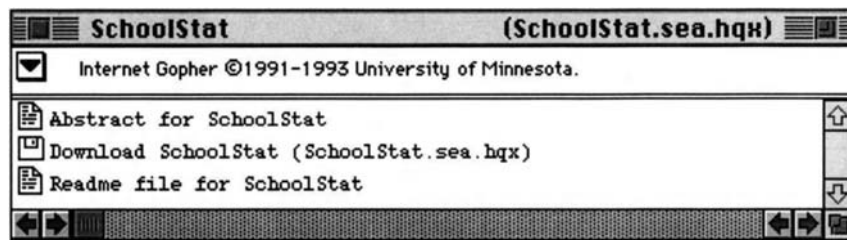


Figure 15: Starting Window for Downloading a File

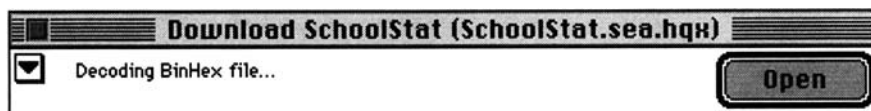


Figure 16: Progress Window in Downloading a File

down menu activated by clicking the pull-down arrow in the upper left-hand corner of each window which can be used to jump back to previous selections. See Figure 14.)

Another major difference is seen in downloading files. Macintosh programs at the Mathematics Archives are stored in "BinHex" format. (This is indicated by the extension .hqx of the files.) BinHex is

a coding of MacBinary into ASCII form so that programs which do not recognize MacBinary format can be used for transferring Macintosh files. However, all of this is transparent to the TurboGopher user because TurboGopher will automatically decode the file back to MacBinary so the file arrives in a recognizable form. To illustrate this, Figures 15, 16, and 17 show a sample download from the Statistics selection of the Macintosh files.

We select the folder SchoolStat and obtain the window in Figure 15;

then double-click on Download SchoolStat, whereupon the window in Figure 16 appears. When the decoding is complete, a dialog box appears (Figure 17), prompting you to select where to put the file.

After the selection of where to store the file is made, the downloading now proceeds with regular updates on the number of bytes received until the transfer is complete. The file that arrives is usually a "self-extracting archive," as indicated by the extension .sea. To uncompress the file, all that is necessary is to double-click the file's icon.

A third comment for the Macintosh user is that some telnet client should be on the Macintosh so that menu items requiring it can be selected and executed properly. Perhaps the most widely used telnet client is the public domain NCSA Telnet. If a telnet selection is made in TurboGopher, the telnet client is automatically started.

Let us now return to the top, or home, menu (Figure 18) and resume our tour of the Mathematics Archives by choosing another main area, Teaching Materials and Other Information, whose menu items are shown in Figure 19.

In this area, materials from the Mathematics Archives and other gophersites are organized by different topics. Direct links are set up to the specialized gophersites CHANCE Database, and the Geometry Forum. If you don't always want to go through the Mathematics Archives to reach one of these sites, then your gopher client lets you set up a bookmark at the particular menu item. Later, when you run the gopher client software, you can look at the

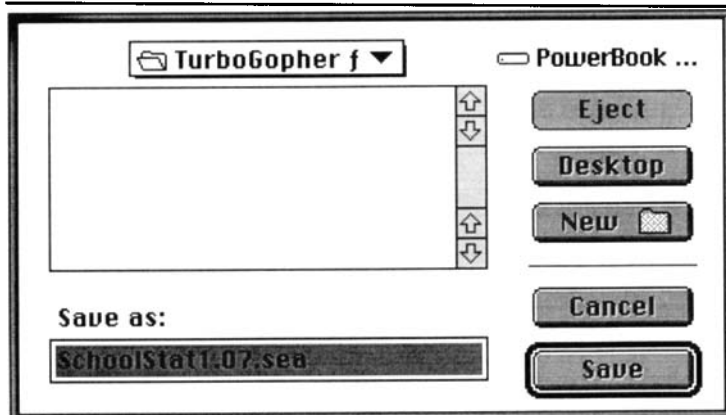


Figure 17: Dialog Box for Saving a Downloaded File

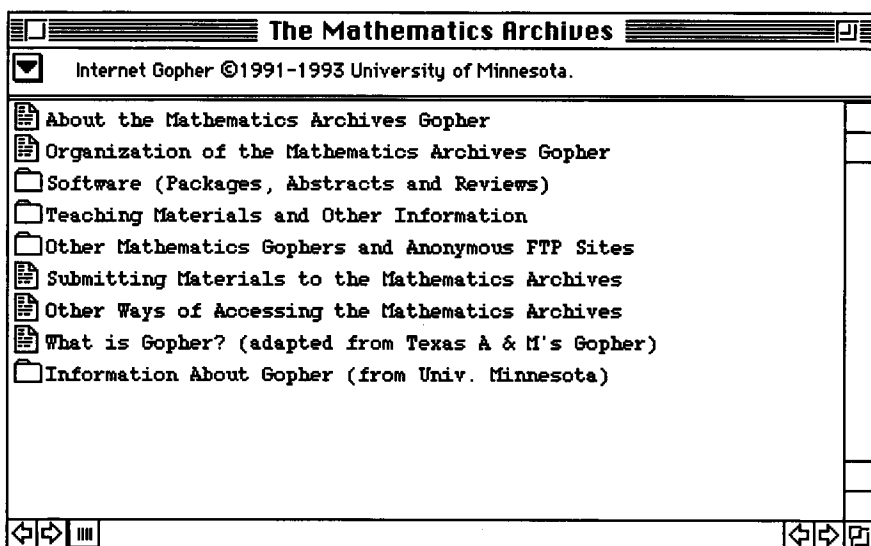


Figure 18: The Home Menu with TurboGopher

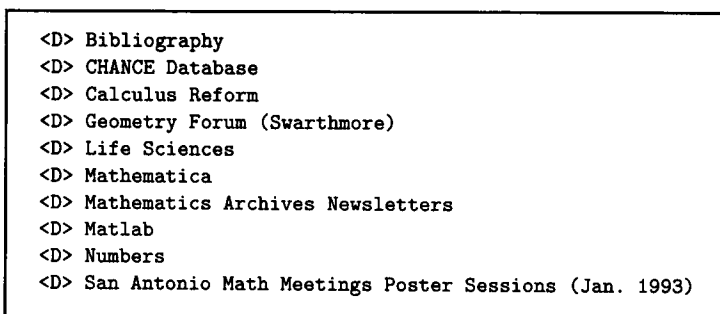


Figure 19: "Teaching Materials and Other Information" Menu

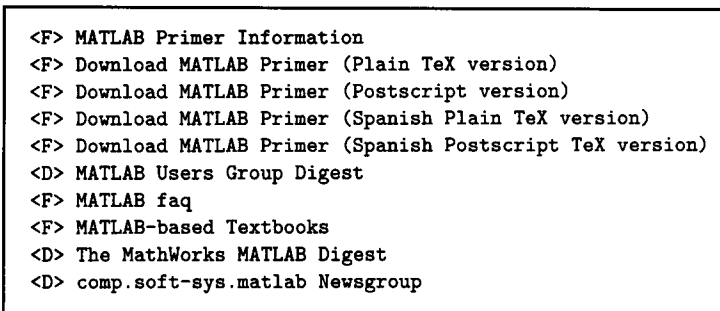


Figure 20: MATLAB Menu

collection of all of your bookmarks and choose one which will provide you immediate access to this particular site.

Again, one of the advantages of the gopher program is that it provides a means for organization of materials from many different sites. For example, if the user chooses Matlab, then the resulting menu is depicted in Figure 20. Materials from five different sites are represented there.

A similar example is the Calculus Reform item. The menu is shown in Figure 21. The first item gives you information (from e-MATH.ams.com, the American Mathematical Society's gopher) on how to join the calc-reform discussion group. The second item (from the site mir.maths.soton.ac.uk in Great Britain) contains an archive of many messages from this discussion group. Even though these sites are not mentioned, they can be identified: on the UNIX server, this can be done by pressing the = key; on the MSDOS machine, this can be done by pressing Alt-f followed by Alt-i; in WSGopher, select the Info on Item on the File menu option; and in TurboGopher, this information is available through the Get Attribute Info selection of the Gopher menu option. As a side note, the Mathematics Archives would like to expand this section of the archives to include information from other sites which have been involved with experimentation in calculus reform.

Finally, to complete the journey through the Mathematics Archives "gopher hole," we look at another major area from the main menu, Other Mathematics Gophers and Anonymous FTP Sites. Its menu is shown in Figure 22.

In these nine categories are contained gopher links to other sites of interest to mathematicians. There is overlap between the links here and in the first two main menu items of the Mathematics Archives. Regarding the third entry in Figure 22, it is worth noting that as of the writing of this article, over sixty mathematics departments worldwide have gopher servers. Links to all those known to the authors are included in this third entry. The fifth and sixth entries have many items, so are too large for display here, but contained therein are links to software archives, databases of software, software and book publishers, governmental agencies, computer

manufacturers, etc.

There are two kinds of gopher programs: a gopher server and a gopher client. If you just want to access other gophersites, then all you need is a gopher client. If you or your department want to provide information via gopher then a gopher server is required. Both of these programs for various platforms are available by anonymous ftp from boombox.micro.umn.edu in the subdirectory pub/gopher.

Two pieces of information are needed to access a gophersite: the Internet address and port number. The Mathematics Archives can be reached by gopher at archives.math.utk.edu with port 70. Most gophers use the standard port 70, but some use a different port. To gopher to the Mathematics Archives from a UNIX machine, type the command

```
gopher archives.math.utk.edu 70
```

To gopher there using TurboGopher, select Another Gopher from the File menu and enter the archives.math.utk.edu as the server name and 70 as the port. The Mathematics Archives has a Gopher+ server, so that box should also be checked. Similarly with WSGopher, select New Gopher from the File menu and enter the archives.math.utk.edu as the server name and 70 as the port; also check the Gopher Plus box. On the PC Gopher III client, you enter this information for the home go-

pher client by choosing the item Application from the menu Configure; it is probably more convenient to set up a bookmark to the Mathematics Archives in this client.

For additional information, the reader is referred to 2 and 4, two popular sources for the Internet. The former is especially useful for the Macintosh user because it comes bundled with all the necessary software to connect a Macintosh with the Internet, including MacTCP and TurboGopher.

## References

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<sup>2</sup>Engst, A. *The Internet Starter Kit for Macintosh*. Hasbrouck Heights, NJ: Hayden Books, 1993.

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<sup>4</sup>Krol, E. *The Whole Internet User's Guide and Catalog*. Sebastopol, CA: O'Reilly & Associates, 1992.

<sup>5</sup>Wachsmuth, B. G. "The Internet: Some Tools for Efficient Usage." *FOCUS* 13 (December 1993): 15–17, 19–21.

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# Navigating the Internet

*Keith Devlin*

*Pocket Guides to the Internet* is a series of six books written by Mark Veljkov and George Hartnell. Published by Mecklermedia, 11 Ferry Lane, Westport, CT 06880, (203) 226-6967, each one is 40 to 60 pages long. The volumes cover, in order, the following topics:

1. Telnetting
2. Transferring Files with File Transfer Protocol (FTP)
3. Using and Navigating Usenet
4. The Internet E-Mail System
5. Basic Internet Utilities
6. Terminal Connections.

Each starts with the same eight-page introduction to the Internet before getting down to the task announced in the volume subtitle. The guides are simply and clearly written, and should provide an adequate introduction to novitiates trying to make their first tentative steps into cyberspace.

My first reaction when I heard about this series was that it was an excellent idea, and approached the publisher with a request for review copies for *FOCUS*. Having read all six volumes, I still think they can be of great use to newcomers to the Internet, but for the more experienced user I am not so sure there is any real advantage to splitting the material into six volumes. It may even be a disadvantage.

For one thing, the volumes are not really pocket-sized. Though each one is thin, their dimensions measure six by nine, larger than the average paperback book.

Second, almost any Internet use requires knowledge of procedures spread over several of the guides, so a user will have to buy and have available all six. This is clearly inefficient as a reference source.

However, I am a fairly experienced Internet user, long past the stage of information overload that greets a newcomer trying to master the system. For the beginner, a 300-page instruction book might well remain unopened on the shelf, while six bite-sized installments might not be so off-putting. So, while I cannot recommend the series as a reference source for the more experienced Internet user, it could be of great help to the beginner.

```
<F> -Calculus Reform Discussion Information
<D> -Calculus Reform Discussion List
<D> Bowdoin College
<F> Bowdoin College Information
<D> Colorado School of Mines
<D> Duke University
<F> Georgia Tech
<F> SUNY Albany
<D> San Antonio Math Meetings Poster Sessions (Jan. 1993)
```

Figure 21: "Calculus Reform" Menu

```
<D> Electronic Journals
<D> Electronic News and Discussion Groups
<D> Mathematics Departments
<D> National Science Foundation Gopher (STIS)
<D> Other Mathematics Software Sources & Information
<D> Other Organizations of Interest to Mathematicians
<D> Preprints and Reports
<D> Societies
<D> TeX
```

Figure 22: "Other Mathematics Gophers and Anonymous FTP Sites" Menu

## *The MAA Gopher—If you haven't seen it you're missing out!*

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**You can access the MAA Gopher several different ways.**

If your computer runs a gopher client, or you can log into a computer with a gopher client, you can access the MAA Gopher by typing:

gopher gopher.maa.org

You can also connect on the WorldWide Web at:

URL <http://www.maa.org/>

## Carnegie Small Planning Grants

The Strengthening Underrepresented Minority Mathematics Achievement (SUMMA) Program of the MAA is pleased to announce that funds are pending from the Carnegie Corporation of New York for a fifth round of Small Planning Grants. The planning grants (up to \$5,000) are to encourage mathematics faculty to initiate intervention projects serving underrepresented minority middle and high school students. The deadline is March 15, 1995. The full solicitation will appear in the February 1995 issue of FOCUS. For a copy of the solicitation, please contact the SUMMA Program, Mathematical Association of America, 1529 18th Street, NW, Washington, DC 20036; (202) 387-5200; fax: (202) 265-2384; e-mail: [summa@maa.org](mailto:summa@maa.org).

# Project NExT Launched

James R. C. Leitzel and T. Christine Stevens

Sixty-six Project NExT fellows gathered on August 12th in Blegen Hall on the campus of the University of Minnesota. Thus began a series of presentations, discussions, short courses, and interactions that spread over three days prior to the opening of the summer MathFest activities in Minneapolis. Project NExT was launched!

The fellows eagerly participated in all of the workshop sessions, and, much to the delight of the co-directors, organized and carried out several events on their own. These events ranged from special sessions on topics of particular interest to several of the participants, to informal discussions at nearby local establishments, to discussions in dormitory lounges lasting late into the night.

Recognizing that the movement to “reform” the teaching of undergraduate mathematics presents special challenges to those just entering the profession, Project NExT was developed to provide not only an overview of current issues in the teaching and learning of undergraduate mathematics, but also to build a network of peers and more experienced mathematicians to provide advice and ongoing professional support. This project of the MAA is funded by the Exxon Education Foundation for a three-year period.

This first class of Project NExT fellows is an extremely impressive group. Their applications contained personal statements about teaching, each displaying a high degree of pedagogical sophistication, and many of the applicants were already wrestling with some of the major issues confronting undergraduate mathematics education. Because so many of the applicants were so well qualified, and because the institutional support was higher than

expected, the first class of fellows was expanded to include 66 individuals, rather than the originally anticipated number of 60.

The sixty-six fellows include 33 men and 33 women holding positions in 30 different states. The institutions represented include two-year and four-year colleges, comprehensive state universities, and research institutions. There are representatives from 23 of the 29 MAA sections. Fifty-two of the fellows received their Ph.D.s in 1993 or 1994.

The Minneapolis workshop included more than 20 hours of special sessions. As the keynote speaker, MAA President Donald Kreider spoke of the new “contract” that is being forged between mathematics and society at large. He noted that mathematicians can no longer expect society to provide the “unquestioned support” that may have been the rule in prior decades, and he suggested that one way to re-establish the connection between mathematics and contemporary society would be for college and university faculty to teach the students we have, not the ones we wish we had.

On the next day, John Baldwin (University of Illinois at Chicago), Ronald Biggers (Kennesaw State College), Gail Burrill (Whitnall Public Schools in Wisconsin), and Janet Ray (Seattle Central Community College) discussed the changes they have observed in the students who enter colleges and universities. They noted differences in preparation and demographics, as well as changes in the expectations that students who have been educated according to the NCTM *Standards* will bring to their undergraduate courses in mathematics. The fellows then had some hands-on

experience with various calculus reform efforts. In small working groups, they discussed problems from Project CALC (Marcelle Bessman, Frostburg State University), the Harvard Consortium materials (William Velez, Uni-



versity of Arizona), and the St. Olaf Project of Arnold Ostebee and Paul Zorn (St. Olaf College). This was followed by a panel discussion on the broader issues of calculus reform. Later that day, the fellows elected to have their own discussion groups on a variety of topics. These included methods for working with students in groups, changing the culture in departments, utilizing writing in mathematics classrooms, and issues centering around teacher preparation. That evening, a panel discussion on the faculty member as teacher and scholar featured Tracy Bibelniecks (University of Minnesota), Richard Herman (JPBM, University of Maryland), Jerry Lodder (New Mexico State University), Doris Schattschneider (Moravian College), and William Velez (University of Arizona).

The final day of the workshop began with a presentation by Carl Leinbach (Gettysburg College) and Marvin Brubaker (Messiah College) on the use of technology in upper division courses. Following this presentation, and again meeting in smaller groups, the fellows discussed using writing to teach mathematics with David Smith (Duke University), using projects in discrete mathematics with Jerry Lodder, and developing a sophomore laboratory course with Margaret Robinson (Mount Holyoke College). This was followed by a group discussion on these alternative approaches to instruction. Susanna Epp (DePaul University) shared with the fellows some of the results of research in collegiate mathematics education and pointed to some issues that still need attention.

The workshop closed with a presentation by Joe Gallian (University of Minnesota-Duluth) on the importance of “finding your niche in the profession.” His comments clearly addressed some of the fellows’ deepest concerns and earned him a stand-



ing ovation. It was an appropriate and stimulating conversation with a master teacher.

Fellows were also expected to participate in the MathFest. Special sessions were offered for them on pre-calculus mathematics (David Dudley, Phoenix Community College), using graphing calculator technology in the teaching and learning of mathematics (Frank Demana, The Ohio State University), and the computer algebra system DERIVE (Leinbach and Brubaker). In addition, the fellows were invited to attend MAA committee meetings and other special activities.

One goal of Project NExT is to build a network of peers and more experienced mathematicians to provide professional support as the fellows launch their own careers. The intense workshop experience got this network of peer support off to a running start. Building on the fellows' time together in Minneapolis, the MAA has established a special electronic network for them and selected "mentors" from the mathematical community. That network has already been quite active in discussing issues of teaching and learning, such as how to structure groups for group learning in the classroom and how to assess writing in mathematics classes. The variety of the fellows' institutions and teaching assignments is reflected in these discussions. The comments of the more experienced mathematicians who have joined the network provide a resource for these new fellows that reaches beyond their home schools.

Project NExT is a full year of commitment on the part of the individual fellows

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#### *Committee Diary* from page 8

been asked yet. To help us keep track of things, we had a comment sheet on each candidate that we filled out, and we referred to it during the interviews.

Someone could make a mint, rolling a food-and-coffee cart around that big interview room.

In our message box, we found a number of items. Some people put their resumes in (and nothing else). Others put whole packets in. We are treating either a resume or a packet as a formal application. That means that we will bring each one back to New

and their home institutions. In addition to the workshop and MathFest last August, the fellows are expected to attend the Joint Mathematics Meetings in San Francisco and the 1995 summer MathFest at the University of Vermont. The task of the co-directors, James R. C. Leitzel (University of Nebraska-Lincoln) and T. Christine Stevens (St. Louis University), has been made a bit easier by the enthusiasm and talents of the fellows, who have taken it upon themselves to plan a program of activities for Project NExT participants at the joint meetings in San Francisco. They also have made several suggestions for enhancing the workshop experience for the next class of fellows. Project NExT will be featured in the program of the Joint AMS-MAA Special Session organized by the Mathematicians and Education Reform Network (MER) during the San Francisco meetings.

Project NExT is supported, in part, by a three-year grant from the Exxon Education Foundation. The second group of fellows will be chosen in the spring of 1995. Further information about Project NExT can be obtained on the MAA Gopher or from James R.C. Leitzel at the University of Nebraska, e-mail: jimleitz@unlinfo.unl.edu.

*For a list of the Project NExT Fellows, see page 16.*

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*James R. C. Leitzel is a professor of mathematics at the University of Nebraska, and co-director of Project NExT; T. Christine Stevens is a professor of mathematics at St. Louis University, and co-director of Project NExT.*

Haven for processing, just like the others, and we will decide on Yes, Maybe, or No for each one.

So there were over five hundred applicants in the ER, and there were sixty-nine employers. Some other employers told me that they have received over four hundred applications so far for one position. At least one school is trying a method where applications are screened immediately when they arrive, and the people who are obviously inappropriate for the position get rejection letters quickly, which follows the "Mattix plan" available over e-MATH.

*To be continued...*

# MAA PLACEMENT TESTS...

**can help solve your  
college's mathematics  
placement problems**

- ◆ Do the members of your mathematics department complain that the students in their classes are not well prepared for their courses?
- ◆ Do your students complain that their mathematics courses are too hard or too easy?
- ◆ Do your faculty advisors rely primarily upon scores on aptitude tests or on high school mathematics courses taken in making recommendations to students about their initial college mathematics courses?

If your answers to these questions are YES, you should know about the **PLACEMENT TEST PROGRAM (PTP)** of the Mathematical Association of America. This program assists two- and four-year colleges and universities with the development of on-campus placement programs to assess the mathematical skills of new students objectively and fairly when they enter college.

Colleges and universities pay an annual fee to subscribe to PTP. This program provides up-to-date tests and placement testing information to its subscribers.

The MAA's Committee on Testing also offers free consulting services to any college mathematics department that is planning to initiate a local mathematics placement program or seeking ways to improve its ongoing program.

For more information or to subscribe, write or call: MAA PT Program, MAA, 1529 Eighteenth Street, NW, Washington, DC 20036, 1-800-331-1MAA.

# 1994-1995 Project NEXt Fellows

## MAA Section of Faculty Appointment

### Allegheny Mountain

Jeongsook Kim, Wheeling Jesuit College, Wheeling, WV

### Eastern Pennsylvania/Delaware

Cheri Boyd, University of Scranton, Scranton, PA

Douglas E. Ensley, Shippensburg University, Shippensburg, PA

Kathleen Madden, Lafayette College, Easton, PA

Camille A. McKayle, Lafayette College, Easton, PA

Robert C. Stolz, Lafayette College, Easton, PA

### Illinois

Jon M. Clauss, Augustana College, Rock Island, IL

Paul R. Coe, Rosary College, Riverforest, IL

James P. Marshall, Illinois College, Jacksonville, IL

Sharon K. Robbert, Trinity Christian College, Palos Heights, IL

Michael Sullivan, Northwestern University, Evanston, IL

### Indiana

Georgia Tolias, Purdue University–Calumet, Calumet, IN

Barbara J. Wahl, Hanover College, Hanover, IN

### Intermountain

Michael Patrick Prophet, Idaho State University, Pocatello, ID

### Iowa

Mark Johnson, Central College, Pella, IA

Douglas Mupasiri, University of Northern Iowa, Cedar Falls, IA

Robin Amie Pennington, Wartburg College, Waverly, IA

Kimberly J. Regnier, Northwestern College, Orange City, IA

### Kansas

Cynthia Woodburn, Pittsburg State University, Pittsburg, KS

### Louisiana–Mississippi

Judith L. Covington, LSU at Shreveport, Shreveport, LA

### MD–DC–VA

Clara S. Chan, Virginia Polytechnic Institute, Blacksburg, VA

Samuel Bruce Smith, Washington College, Chestertown, MD

### Metropolitan New York

Laurel Cooley, York College–CUNY, Jamaica, NY

### Missouri

Albert J. Goodman, University of Missouri–Rolla, Rolla, MO

Michael Hilgers, University of Missouri–Rolla, Rolla, MO

Ilene H. Morgan, University of Missouri–Rolla, Rolla, MO

Timothy Robert Ray, Southeast Missouri State University, Cape Girardeau, MO

### Nebraska–Southeast South Dakota

Peter Gavin LaRose, Nebraska Wesleyan University, Lincoln, NE

### New Jersey

Wen Yao Zhang, Union County College, Cranford, NJ

### North Central

Lynne Baur, Carleton College, Northfield, MN

Thomas Ratliff, St. Olaf College, Northfield, MN

Deirdre L. Smeltzer, University of St. Thomas, St. Paul, MN

Kevin Strobel, University of Minnesota, Minneapolis, MN

### Northeastern

Julian Fleron, Westfield State College, Westfield, MA

Sandra L. Rhoades, Smith College, Northampton, MA

### Northern California

Julie Suzanne Glass, California State University–Hayward, Hayward, CA

### Ohio

Greg Bishop, College of Mt. St. Joseph, Cincinnati, OH

Heather Hulett, Miami University, Oxford, OH

Luiz Felipe Martins, Cleveland State University, Cleveland, OH

Steve Morics, Oberlin College, Oberlin, OH

### Oklahoma–Arkansas

Philip Crow, Southern Nazarene University, Bethany, OK

Mary Ellen Foley, University of Oklahoma, Norman, OK

Janet C. Woodland, University of Arkansas, Fayetteville, AR

### Pacific Northwest

Jennifer McNulty, The University of Montana, Missoula, MT

Tom Roby, Reed College, Portland, OR

### Rocky Mountain

Erik S. Van Vleck, Colorado School of Mines, Golden, CO

### Southeastern

Dennis Evans, Coker College, Hartsville, SC

Mark Charles Ginn, Austin Peay State University, Clarksville, TN

Arnaldo Horta, Jr., Armstrong State College, Savannah, GA

Elsa J. Newman, West Georgia College, Carrollton, GA

Emily E. Puckette, Duke University, Durham, NC

Bettina E. Schmidt, Auburn University–Montgomery, Montgomery, AL

Scott A. Smith, Columbia College, Columbia, SC

Stephanie Tyler, University of Tennessee–Martin, Martin, TN

Todd G. Will, Davidson College, Davidson, NC

Analee Witt, Austin Peay State University, Clarksville, TN

Olga Yiparaki, Agnes Scott College, Decatur, GA

### Southern California

Michael A. McDonald, Occidental College, Los Angeles, CA

Jose H. Giraldo, Texas A&M University, College Station, TX

Ruth Gornet, Texas Tech University, Lubbock, TX

Gertrud L. Kraut, University of Texas at Tyler, Tyler, TX

Ruth Ingrid Michler, The University of North Texas, Denton, TX

Wasin So, Sam Houston State University, Huntsville, TX

### Wisconsin

Fe S. Evangelista, University of Wisconsin–Marathon Center, Wausau, WI

Asuman Oktac, University of Wisconsin–Oshkosh, Oshkosh, WI

Anthony D. Thomas, University of Wisconsin–Platteville, Platteville, WI



## News From The Sections

The vitality and diversity of the MAA are evident in the work of the sections of the Association. Below are descriptions of some of the activities and programs of the sections over the past year.

**Allegheny Mountain** The Allegheny Mountain Section held its annual meeting April 8th and 9th on the campus of West Virginia University in Morgantown, West Virginia. About 100 persons were in attendance, including about 20 students.

John Maceli (Ithaca College, Ithaca, New York), presented a minicourse titled "Student Projects in Calculus," in which 12 members of the section participated.

There were four invited addresses. Susan Forman (Mathematical Sciences Education Board), spoke on "Promoting Faculty Growth in Undergraduate Mathematics." The section's 1993 Distinguished Teacher, Professor George Andrews (Pennsylvania State University), spoke on "Ramanujan, Continued Fractions, and Educational Reform." Robert Davis (Rutgers University), spoke on "Analyzing How Students Think About Mathematics." Sonja Sandberg (Framingham State College) spoke on "The Mathematics of Epidemics."

There was a social hour followed by a banquet Friday evening at which the 1994 Distinguished Teaching Award was presented in absentia to Professor David M. Bressoud (Penn State—University Park). Faculty and student talks followed, and the evening finished with a pizza party. Saturday featured eight sessions of contributed papers, 13 by faculty members and ten by students.

The section's business meeting was held at breakfast on Saturday.

The section held its Tenth Annual Allegheny Mountain Section Summer Short Course, "A Mathematical Sampler, 1647-1900," by William Dunham of Muhlenberg College, June 13-17, 1994.

**Eastern Pennsylvania and Delaware** The EPADDEL Section sponsored two regular meetings and a one-day student conference on careers in mathematics. The fall section meeting on November 13, 1993, at Cedar Crest College, in Allen-



town, Pennsylvania, featured invited speakers Joseph Gallian (University of Minnesota, Duluth) speaking on "The Mathematics of Identification Numbers"; Carl Pomerance (University of Georgia) on "Fermat's Little Theorem"; Kenneth A. Brakke (Susquehanna University) on "Soap Films and Covering Spaces"; and Mary Ellen Rudin (University of Wisconsin) on "The Rationals and the Irrationals." JoAnne S. Growney (Bloomsburg University of Pennsylvania) gave a luncheon presentation, "Mathematics in Poetry."

The spring section meeting was held jointly with PSMATYC, the Pennsylvania State Mathematical Association of Two-Year Colleges, at Harrisburg Area Community College in Harrisburg, Pennsylvania on March 12, 1994, and featured talks related to the teaching of mathematics. The four invited addresses were "Calculus: Concepts, Computation, Composition, and Cooperation," by David A. Smith (Duke University); "The Harvard Calculus Consortium and the Reform Program in Mathematics," by Andrew Gleason (Harvard University); "Using a Graphing Calculator to Enhance the Teaching of College and Intermediate Algebra," by Stanley R. Clemens (Bluffton College); and "Teaching Undergraduate Mathematics Using Technology," by Roseanne Hofmann (Montgomery County Community College). Nine workshops were presented.

Sessions for student-contributed papers were held at each meeting, with a total of eleven student presentations. The student paper contest winner, Jennifer Orehowsky, Ursinus College, was presented with a certificate and a check by Professor Ayoub Ayoub, organizer of the contest. Professor William Dunham of Muhlenberg College received the 1994 EPADDEL Section Distinguished Teaching Award, and outgoing President Nancy Hagelgans of Ursinus College was presented a plaque in recognition of her many contributions to the EPADDEL Section.

A one-week summer workshop titled "Mathematical Modeling Workshop," presented by Jefferson Hartzler (Pennsylvania State University), and directed by Marvin Brubaker (Messiah College), was held at that college.

**Florida** The twenty-seventh annual meeting of the Florida Section was held February 25th-26th at Daytona Beach Community College in Daytona Beach, Florida. The meeting included twenty-four contributed papers, meetings of department chairs, a meeting of the Florida Two-Year College Mathematics Association (FTYCMA), and a meeting of SIGCALM. Dennis Runde (Manatee Community College) presented a minicourse, "TI-85 Applications in the Pre-Calculus and Calculus Courses." Plenary speakers were Underwood Dudley (DePauw University) who spoke on "Angle Trisectors," Donald L. Kreider (Dartmouth College and past-president of the MAA) who spoke on "The Roots of Recursion in Mathematics," and P.J. McKenna (University of Connecticut) who spoke on "Nonlinear Oscillations in Suspension Bridges." Invited lectures were given by Don Hill (Florida A&M University), Linda Smith and Moana Karsteter (Tallahassee Community College), and Scott H. Hochwald (University of South Florida) speaking on "Teaching Math at Africa University," "Seeking Patterns and Connections in Sequences," and "Tales from the Harmonic Series," respectively.

Professor Fredric Zerla (University of South Florida) received the Distinguished Service Award for 1994. Professor James Wahab (Rollins College) was the recipient of the Distinguished University Teaching Award.

Four regional meetings occurred this year in addition to the annual meeting.

The section gave a volume of the New Mathematical Library to each of the thirty-five top scorers in Florida on the AHSME. In addition, the section assisted with expenses for three students presenting papers at the annual section meeting, and for two students to go to the national summer meeting in Minneapolis.

**Illinois** The seventy-third annual meeting of the Illinois Section was held at Parkland College in Champaign, Illinois, April 22-23, 1994. It was organized by

LaVerne McFadden and Caroline Goodman of that college. There were 142 registrants.

The group heard fifteen invited talks; four student papers; an opening address, "Promoting Faculty Growth in Teaching and Scholarship," by Susan Forman (director of College and University Programs for the Mathematical Sciences Education Board, on leave from Bronx Community College); and a closing address, "Breaking Drivers' License Codes," by Joseph Gallian (University of Minnesota, Duluth). Graham Evans (University of Illinois) gave a banquet address on "Mathematics and Music, the Musings of a Beginning Cellist." Fred Rickey, Bowling Green State University, led a minicourse, "Using History in the Mathematics Classroom."

Four student teams participated in a math contest arranged by J.B. Stephen, student chapter coordinator (Northern Illinois University).

The section's Distinguished Service Award was presented to Neale Fadden (Belleville Area College); the section's Award for Distinguished College or University Teaching was given to Ronald M. Shelton (Millikin University).

The Illinois Section is the home of Patrick D. McCray (G. D. Searle and Company, Skokie, Illinois) who is a newly-elected governor-at-large of the Association.

The Illinois Section sponsors a high school lecture program which brings mathematicians from local colleges, universities, or businesses to high school classes or mathematics clubs.

**Indiana** The fall 1993 Indiana Section meeting at Indiana University Kokomo featured a tour of Delco Electronics Corporation and a SUMMA workshop presented by Bill Hawkins of the MAA. Mathematical presentations included an invited address by Elliot Tanis (Hope College, Michigan), titled "Random Numbers In, Answers Out: Maple V Simulations."

The spring 1994 section meeting at DePauw University included an invited address, "Linear Algebra and Serious Applications," by Gilbert Strang (MIT); and papers, "Solving Systems of Polynomial Equations," by Gene Freudenburg (Ball State University); "Newman Polynomials," by Bart Goddard (Rose-Hulman

Institute of Technology); "Using a Laboratory Approach to Teaching Basic Concepts of Group Theory," by Ellen Parker (DePauw University); and "The Asymptotic Behavior of the Zeros and Poles of the Normalized Pade Approximants to  $\exp(z)$ ," by Amos Carpenter (Butler University).

At the spring meeting, students C. Christopher Smith (Taylor University) and Stacy Bogataj (Saint Mary's College) spoke on "Simulation of the Rivest-Shamir-Aldermand (RSA) Cryptology Scheme," and "Pitching Statistics," respectively. In conjunction with the meeting, the section held its twenty-ninth annual Indiana College Mathematics Competition.

The Indiana Section's Distinguished Teaching Award was presented to David S. Moore (Purdue University) and its Distinguished Service Award was presented to Billy Rhoades (Indiana University).

The Indiana Section is glad about the state's participation in the AHSME and the AJHSME. At its spring meeting, the section presents plaques to the state winners on these exams.

**Intermountain** The Intermountain Section of the MAA convened at Westminster College in Salt Lake City, Utah, April 8-9, 1994. Lance Littlejohn (Utah State University) gave a short course on orthogonal polynomials and was awarded the section's Distinguished Teaching Award. A panel discussed the limited employment in mathematics and stressed the need for employer and employee to treat each other with dignity, honesty, and fairness. After the annual banquet, Kenneth Ross, who grew up in Salt Lake City, reminisced about the mathematics instruction he had received there and some of his most-remembered teachers, many of whom were known to section members. This brought back many nostalgic memories.

**Iowa** The Iowa Section met jointly with the ASA and IMATYC at Grinnell College, Grinnell, Iowa, April 15-16, 1994. Former Pólya Lecturer Patricia Rogers (York University) spoke on "Classroom Climate and Other Issues," and on "You Can't Do That in MY Classroom: Curriculum Transformation and Mathematics Education." James Hall (Deere and Company) spoke on "Neural Networks and Genetic Algorithms: Applications in Finance and Engineering."

There were twelve student papers; a panel discussion, "Teaching the History of Mathematics"; eleven contributed papers; and three computer demonstrations: "Creative Approaches to Mathematical Visualization," by Deane Arganbright (Whitworth College, Spokane, WA), "Calculus Using Mathematica," by Keith Stroyan (University of Iowa), and "Using XLISP-STAT for Teaching and Consulting," by Russell V. Lenth (University of Iowa).

**Kansas** The annual meeting of the Kansas Section was held at the University of Kansas, March 11-12, 1994, with eighty-one people attending.

There were five workshops: "Proposal Writing," by William Hawkins (director of the MAA SUMMA project); "The Hewlett Packard HP48 in Undergraduate Mathematics Courses," by Robert D. Adams (University of Kansas); "Using Software to Teach Concepts to Business MBA Students," by Teresita S. Salinas (Washburn University); "Calculator Activities/Projects for Enhancing Student Involvement in College Algebra and Pre-calculus," by Marilyn Carlson (University of Kansas); and "Interactive Electronic Laboratories for Calculus and Geometry of Surfaces," by Thomas Banchoff (Brown University). Banchoff also delivered the talk "Beyond the Third Dimension: From Flatland to Hypergraphics."

There were sixteen contributed papers, seven student papers, and three panel discussions. Traditional in the section is a breakfast meeting at which issues related to mathematics education in Kansas are discussed.

**Kentucky** The annual meeting of the Kentucky Section was held April 8-9, 1994 at Morehead State University, with total attendance of ninety-six people. The meeting included a short course, "Calculus from an Historical Perspective," by Daniel Otero (Xavier University), and a workshop by John Kenelly (Clemson University), titled "Priming the Pump for Curricular Change." The meeting offered its social, "Aftermath," after an invited address Friday night by Keith Devlin, editor of FOCUS, followed in turn by a pizza party specifically for student members. The section had informal announcements and discussions at its Saturday morning breakfast meeting.

There were two invited addresses, eigh-

teen contributed papers from faculty, and six student papers.

This year the section is proud of Kentucky's AHSME participation and of the results of its efforts to increase student participation in its meetings. It also has increased participation of faculty from two-year colleges; the Kentucky Section of the MAA and the Kentucky MATYC cooperate in publishing newsletters together. The section offers three newsletters each year.

**Louisiana-Mississippi** The Louisiana-Mississippi Section held its annual meeting March 4-5, 1994 at Nichols State University, with an attendance of 255, one hundred of whom were students. The section has worked to provide activities of interest to students, and this meeting offered a student competition, student paper sessions, and a panel discussion on careers.

The beautifully organized meeting included a workshop on graphing calculators and dynamical systems, and panel discussions on calculus reform and mathematics education. Leonard Gillman spoke on "Some Irreverent Thoughts on the Teaching of Mathematics." Highlights of the meeting included a Cajun reception, a crawfish boil, and a concert by Gillman on the piano, and Carol Dale on flute.

**Maryland-DC-Virginia** The annual fall meeting of the Maryland-DC-Virginia Section was held on November 12-13, 1993, at Montgomery College, Takoma Park, Maryland. The meeting program featured a banquet, two invited speakers, a panel discussion and workshop, and five contributed paper sessions, including one made up entirely of student presentations. Keith Devlin (Saint Mary's College and editor of FOCUS) spoke on "Whose Mother Is It?: In Search of a Mathematical Theory of Communication"; Underwood Dudley (DePauw University) spoke on "Angle Trisectors"; Elizabeth Teles (Montgomery College), Genevieve Knight (Coppin State College), and Jim Sandefur (Georgetown University) offered the panel discussion, "NSF Innovation Grants: New Opportunities"; and Teles presented a workshop on "Grant Opportunities for Innovation in Collegiate Mathematics." A workshop, "Energy Systems Modeling," was a follow-up meeting of the June 1993 section workshop.

The section held its annual spring meeting April 15-16, 1994 at Saint Mary's College of Maryland, with ninety-four faculty and seventy-three students registered. The section offered a workshop on SPSS by Alham El-Hage Tannouri (Morgan State University). There were both student and faculty paper sessions. The three invited addresses were "Conceptual Issues in Conservation of Biological Diversity," by Robert McKelvey (University of Montana); "Visual Clustering, Modes, and Nonparametric Density Estimation," by David Scott (Rice University); and "Some History of Fermat's Last Theorem," by V. Frederick Rickey (Bowling Green State University).

The 1994 John M. Smith Distinguished Teaching Award was presented to David Lay (University of Maryland).

The Maryland-DC-Virginia Section is the home of Jacob A. Lurie (Montgomery Blair High School, Silver Spring, Maryland) who is a member of the United States' history-making 1994 IMO team. The section is also the home of Genevieve Knight (Coppin State College in Baltimore, Maryland) who is a newly-elected governor-at-large of the Association.

**Metropolitan New York** The Metropolitan New York Section held its annual meeting on May 1, 1994 at the U.S. Merchant Marine Academy in King's Point, New York. There were eight contributed papers and two invited addresses, "What are the Best Sphere Packings?" by John H. Conway (Princeton University), and "You Can't Do That in MY Classroom," by Pat Rogers (York University).

The section is proud of its Mathematics Awareness Week activities, which included proclamations from Governor Mario Cuomo and Mayor Rudolph W. Giuliani of New York City. These were circulated to local media. The section also held a well-attended program at John Jay College of Criminal Justice, where Professor Charles Peskin of NYU-Courant spoke on computer heart simulation, and Professor H.M. Edwards, also of Courant, spoke on Fermat's Last Theorem.

The section held its eighteenth annual Mathematics Fair at Pace University. Awards were given to the student winners of the fair and to the highest local scorers in the Putnam and AHSME competitions.

The Metropolitan New York Section is the home of Aleksandr L. Khazanov (Stuyvesant High School, New York City); Khazanov is a member of the United States' history-making 1994 IMO team.

**Michigan** At the annual meeting of the Michigan Section at Alma College, April 29-30 1994, out-of-state speakers were Leonard Gillman (University of Texas at Austin), Underwood Dudley (DePauw University), Kay Somers (Moravian College), and Prasad Tetali (AT&T Bell Labs). Provocative talks included "Down with Determinants," by Sheldon Axler (Michigan State University), "(Down With) Angle Trisectors," by Dudley, "Some Irreverent Thoughts about the Teaching of Mathematics," by Gillman, and "Reversibility and Reciprocity," by Tetali. A concert featured Gillman on piano and Ernest Lloyd (Central Michigan University) on cello.

The section's Award for Distinguished College or University Teaching was presented to Jerrold Grossman (Oakland University), author and teacher, one of whose students testified, "(his class) remains, for many of us, our best learning experience. It convinced me of the significance of mathematics." The section's Distinguished Service Award went to Jean Calloway (professor emeritus at Kalamazoo College), whose substantial contributions to the section include founding the High School Visiting Lecturer program. John Kiltenen was thanked for his many years of outstanding service as newsletter editor.

Ruth Favro (Lawrence Technological University) reported that the annual Michigan Mathematics Prize competition for high school students had about 16,000 participants from about four hundred schools. Each year, volunteer members of the Michigan Section grade the written solutions for Part II of the test, and the section organizes an awards day to recognize the accomplishments of the top one hundred students. For the next three-year period, the competition will be hosted by Grand Valley State University.

Co-sponsored by the Michigan Section, the Michigan Calculus Network, MichMATYC, and Western Michigan University, the Fifth Annual Michigan Conference on College Mathematics was held at Western Michigan University in

Kalamazoo, Michigan, on March 12, 1994. The topic was "Strategies for Teaching."

**Missouri** The spring meeting of the Missouri Section was held jointly with the Missouri Council of Teachers of Mathematics (MCTM), April 8-9, 1994 at Missouri Southern State College.

The meeting was preceded by a two-and-a-half hour short course on using the history of mathematics in the classroom, and a two-and-a-half hour workshop on MATLAB. The Missouri Mathematics Association for the Advancement of Teacher Training conducted a business meeting and presented a speaker. There were two panel discussions, one on "Careers in Mathematics," and one on "Assessment of Student Learning for Improving the Undergraduate Major in Mathematics."

Invited addresses were given by Martha Siegel (Towson State University and editor of *Mathematics Magazine*) on "Mathematics, Industry, and Jobs"; by J. Wanzer Drane (Department of Epidemiology and Biostatistics, School of Public Health, University of South Carolina) on "Correcting for Selection Bias in a Male Sample Survey"; and by Ron Harrist (Biometry, School of Public Health, University of Texas at Houston-Health Science Center). Drane also delivered an after-banquet address, "Use of Geographic Information Systems (GIS) as a Tool for Investigating the Relationship between Electrical Power Lines and Cancer."

There were twenty-eight contributed papers, five of which were from students. There was a reception for students on Friday night, co-sponsored by Missouri Southern Kappa Mu Epsilon.

Invited speakers at the meeting were sponsored by a private foundation, the host college, and the MAA.

**Nebraska-SE South Dakota** The annual meeting of the Nebraska-Southeast South Dakota Section of the MAA was held April 22-23 on the campus of Nebraska Wesleyan University, Lincoln, Nebraska. There were fifty-five people in attendance the first day and forty-five the second. Kenneth Ross (University of Oregon and President-Elect of the Association) spoke on "Understanding and Sensitivity of the Job Market," and on "The Mathematics of Card Shuffling." In addition, there were

fifteen contributed papers and a panel discussion to update federal- and state-funded programs in the Nebraska-Southeast South Dakota Section.

The section presented its Award for Distinguished Teaching to Jim Lewis (University of Nebraska).

**New Jersey** The fall meeting of the New Jersey Section at Union County College included talks by Israel Gelfand, William Dunham, Tilla Weinstein, and John Ewing; and a SUMMA workshop. The spring meeting at Rutgers University included talks by Thomas Banchoff, Joseph Rosenstein, and John Conway. There were student speakers and sessions for contributed papers. At both meetings there were book exhibits by commercial publishers, door prizes, and a silent book auction. The section thanks James Magliano and Joseph Rosenstein for serving as hosts for the meetings this year.

The 1994 New Jersey Section Award for Distinguished Teaching of Mathematics was presented to Richard Bronson (Fairleigh Dickinson University).

**North Central** The fall meeting of the North Central Section was held at the University of North Dakota, October 22nd and 23rd, and featured invited addresses by Wally Sizer (Moorhead State University) and Pólya Lecturer Patricia K. Rogers (York University).

The spring meeting was held April 22nd and 23rd at Winona State University. John Fulton (University of Missouri-Rolla), Keith Devlin (Saint Mary's College), and Dave Uherka (University of North Dakota) gave invited addresses. Mark Krusemeyer (Carleton College) received the section's Outstanding Teaching Award, and Gerald Bergum was honored with the section's Meritorious Service Award.

**Northeastern** A major project for the Northeastern Section this year was the workshop for students, "Mathematics Opens Doors to the World: Careers in the Mathematical Sciences." With students and faculty attending from as far away as Nova Scotia, the day was an extremely successful one for all participants. Many requests were made for future workshops.

A highlight of the section's spring meeting was the presentation of the section's Award for Distinguished College or University Teaching to Robert L. Devaney

(Boston University).

For the third year in a row, the very active Northeastern Section has offered its spring dinner meetings; this year there were five such meetings. Its one-day minicourse, "Teaching the Introductory Statistics Course," was led by Robin Lock and Richard Cleary.

The section is looking forward to its fall presentation, "Mathematical Aspects of the Music of Bach," by Victor Hill. This is an event that should be well received by the general community, as well as by mathematicians.

The Northeastern Section is the home of two members of the United States' history-making 1994 IMO team: Noam M. Shazeer (Swampscott High School, Swampscott, Massachusetts) and Johnathan Weinstein (Lexington High School, Lexington, Massachusetts).

**Northern California** The annual meeting of the Northern California Section of the MAA was held at San Jose City College in San Jose, California, on Saturday, February 12, 1994. There were 210 participants. The program consisted of five invited talks: Jean Pedersen (Santa Clara University) spoke on "From Geometry to Number Theory"; Keith Devlin (Saint Mary's College) on "How Do You Know This Is A Title?"; Nelson Max (Livermore Laboratory) on "Light Scattering from Surfaces and Volumes"; Edward F. Schaefer (Santa Clara University) on "Wiles' Proof of Fermat's Last Theorem"; and Constance Reid on "Searching for Eric Temple Bell."

Professor Jane Day (San Jose State University) was presented with the Northern California Section Award for Distinguished College or University Teaching.

In 1995 the section will hold a two-day joint meeting with the Southern California Section at California Polytechnic State University in San Luis Obispo.

**Ohio** The annual spring meeting featured a keynote address by S. Brent Morris (National Security Agency) titled "Magic, Card Tricks, and the Perfect Shuffle." Other invited addresses were given by Alice Silverberg (Ohio State University) on "Fermat's Last Theorem and Elliptic Curves"; Joe Kennedy (Miami University) on "Lights and Strings and Things"; and Tom Hern (Bowling Green State Univer-

sity) on "The Image of a Circle-When Eigenvalues Do Not Quite Cut It." The spring meeting always involves students to a high degree and did so again this year. In addition to the presentation of eighteen papers by students, there were a pizza party and a microcourse, "Problem-Solving For Fun and Profit," by Darrell Horwath and Leo Schneider (John Carroll University).

The annual summer short course was given by Hugh L. Montgomery (University of Michigan) titled "Computational Laboratories in Number Theory."

As a new venture, the section is starting a mathematics essay contest for undergraduates this year.

**Oklahoma-Arkansas** The fifty-sixth annual meeting of the spirited Oklahoma-Arkansas Section of the MAA was held March 25-26, 1994, at Harding University in Searcy, Arkansas. There were seventy-five regular and ninety-two student registrations. One hundred ten people attended the Friday night banquet. There were sixty-eight contributed talks, including thirty-three student talks and two others delivered at a special session on "College And University Mathematics Curricular Reform Projects Funded by the NSF," chaired by John Watson (Arkansas Tech University).

At the meeting, James Leitzel (University of Nebraska at Lincoln), supported by the National Science Foundation, led a related faculty workshop titled "Hands-On Workshop on NSF Proposal-Writing and Evaluation." A free conference on careers in mathematics was led by Robert Eslinger (Hendrix College), with special funding from the Exxon Foundation through the national office of the MAA. Nearly ninety students registered for this event.

The section welcomed Keith Devlin as its invited speaker for the meeting. Prof. Devlin's topic was "Whose Mother Is It?: The Search for a Mathematical Theory of Everyday Communication." Thomas Banchoff was warmly received as the Nathan A. Court Lecturer, speaking on "Visualizing Different Dimensions: From Flatland to Interactive Hypergraphics."

The winner of the third annual Distinguished College or University Teaching of Mathematics Award was Lisa Mantini (Oklahoma State University). The section continued its tradition of honoring two top

public school teachers of mathematics in each of the two states, Oklahoma and Arkansas.

**Pacific Northwest** The Pacific Northwest Section held its annual meeting June 16-18, 1994, jointly with the Western Region of the AMS, at the University of Oregon, in Eugene, Oregon, with 229 people registered. The section enjoyed five student papers, which were reports of NSF REU projects from last summer. Students were feted with a pizza party at lunch the second day. The section arranged local housing with U of O graduate students for students who were presenting papers.

Invited talks were presented by Carl Pomerance (University of Georgia), "Witnesses of composite numbers," and Doris Schattschneider (First Vice-President of the Association), "Was Escher a Mathematician?" There were twelve contributed papers; a panel discussion, "The Baby and the Bathwater," chaired by Stu Thomas (University of Oregon); three minicourses; a grant-proposal writing workshop, by Florence Fasanelli (MAA's SUMMA office); and a salmon bake.

Millie Johnson (Western Washington University) received the section's Distinguished Teaching Award, and presented a talk titled "The Mathematics of Meanders: Rivers, Channelization, Floods, and the Environment."

**Rocky Mountain** The annual meeting of the Rocky Mountain Section was held April 15-16, 1994, on the campus of the South Dakota School of Mines and Technology in Rapid City, South Dakota. It was organized by Donald Teets and Janet Burgoyne of that school. The keynote address was "What Have Elliptic Curves Got to Do With It?" by Fernando Gouvea (Colby College). Celestino Mendez (Metropolitan State College of Denver and governor of the section) chaired a panel discussion on "The New NCTM and MAA Assessment Standards and Their Implications for Mathematics Higher Education."

The section is particularly concerned with articulation with the NCTM and with the Standards for school mathematics. It voted to add three representatives of the NCTM to the section's Executive Committee this year.

Tom Kelley (Metropolitan State College of Denver) offered a workshop on the TI-

85 calculator. There was a banquet at which Fernando Gouvea spoke on "A Marvelous Proof"; there were twenty-one contributed talks from among the seventy-five participants at the meeting.

The section gave A. Duane Porter (University of Wyoming) its Award for Distinguished College or University Teaching of Mathematics. The section now awards a free MAA student membership to its top-scoring Putnam Exam student each year; it awards certificates of recognition to high scorers on the AHSME, and organizes a reception in Denver for AHSME achievers.

**Seaway** The Seaway Section held its annual fall meeting at Onondaga Community College in Syracuse, New York. It was held jointly with NYSMATYC. Sam McInroy (Corning Community College) offered a banquet address, "Mathematics, Mother, and Menschenwerk: A Pictorial Essay on the Mathematical Shapes and Principles Found in Nature and Society." The John F. Randolph Lecture in Mathematics Education was given by Israel Kleiner (York University) on "A History-of-Mathematics Course for Teachers, Based on Great Quotations." There was a session of student papers, featuring five papers. Continuing its series of workshops on using technology in the classroom, the section offered the workshop "Using Graphics Calculators in Finite Mathematics," by Jack Graver (Syracuse University).

The spring meeting of the section was held at the State University of New York (SUNY) at Albany, April 22-23, 1994, with 160 people attending. Professor Steven Hilbert (Ithaca College) was presented with a framed certificate honoring him as the section's 1993-94 Distinguished College Teacher of Mathematics, conferred by Section Chair H. Joseph Straight (SUNY Fredonia). Professor Rebecca Hill was recognized for her service as governor of the Seaway Section. William Siegmann (Rensselaer Polytechnic Institute) gave an after-dinner address on computer calculus and workshop calculus at Rensselaer.

Invited addresses were "Viewing and Calculating the Roots of a Polynomial Equation are as Easy as Coloring a Flag Red, White, and Blue, or Hiking along a Continental Divide," by William F. Lucas (The Claremont Graduate School); "Soap

Bubble Clusters, Including New Results by Undergraduates," by Frank Morgan (Williams College); and the 1994 Harry M. Gehman Lecture, "Imaging the Interior of the Body with Electric Fields," by Margaret Cheney (Rensselaer Polytechnic Institute). Beverly H. West (Cornell University) presented a workshop, "Teaching Differential Equations with Interactive Computer Graphics." Contributed paper sessions included ten faculty papers and eight student papers.

The Seaway Section is the home of Jeremy Bem, (Ithaca High School, Ithaca, New York), a member of the United States' history-making 1994 IMO team.

**Southeastern** The Southeastern Section had three excellent invited speakers for its annual meeting at Carson-Newman College: Jack Brown (section lecturer, Auburn University) spoke on "Restriction Theorems in Real Analysis"; Amassa Fautleroy (North Carolina State University) chose as his topic, "Hyperbolic Geometry and Fermat's Last Theorem"; and Andrew Granville (University of Georgia) spoke "Some Remarks about the Proof of Fermat's Last Theorem." Three short courses were offered: "History of Mathematics," by Billy Bryan (Vanderbilt University); "Mathematical Economics," by John Baxley and John Moorhouse (Wake Forest University); and "Statistical Programming on the TI-81," by Richard Stephens (Western Carolina University).

Two popular events for students attending the meeting were the pizza lunch which the section provided for them and the faculty advisors of student chapters, and the TA Rush which was held in conjunction with this lunch. The section was pleased to recognize the high achievement of Craig Gentry on the Putnam Exam by the presentation of a \$100 check. Mr. Gentry's score on the exam was the highest in the section.

The section's Award for Distinguished College or University Teaching was presented to John D. Neff (Georgia Tech), and the section's Distinguished Service Award was presented to James G. Ware (University of Tennessee at Chattanooga).

Supported by a grant from the Exxon Education Foundation, the section sponsored an undergraduate symposium of workshops on environmental applications

of mathematics. The symposium was organized by Bucky Allen (Francis Marion University).

**Southern California** The annual fall meeting of the Southern California Section was held jointly with the American Mathematical Society at the Harvey Mudd campus of The Claremont Colleges on November 6, 1993. There were three invited addresses: "Myths of Mathematics," by Morris W. Hirsch (University of California, Berkeley); "When Algebra Met Topology," by Melvin Henriksen (Harvey Mudd College); and "Recent Court Rulings on Apportioning Fractions," by H. Arthur DeKleine (Cal Poly, San Luis Obispo). There was an invited lecture/demonstration, "Computer Experiments in ODEs: Cats, Scrolls, Chaos," by Courtney Coleman (Harvey Mudd College) and two Harvey Mudd students, Benjamin Beechick and F. Leo Parker. There was a student poster session and three contributed papers.

The Southern California Section received an Exxon Education Foundation grant via the Committee on Student Chapters which provided for enhanced student participation in its two meetings. In particular, the grant supported a student poster session at the fall meeting, described above, and seventeen papers presented by eighteen students representing nine colleges and universities, making up the contributed paper session at the spring meeting.

In addition, the Exxon grant supported a symposium on contemporary problems in society, Mathematical Modeling of Environmental Problems, at the spring meeting. The symposium consisted of three papers: F. M. Fujioka (U.S. Forest Service) on "Weather by the Numbers"; E. Cumberbatch (Claremont Graduate School) on "Fog Capture"; and T. Dolan (Environmental Applications) on "Mathematical Modeling of Soil Vapor Extraction."

Ali Zakeri, student chapter coordinator, recognized the student speakers at the meeting's luncheon and presented books as prizes to the student winners of the prize lottery. Student chapters in the Southern California Section raise funds by selling mathematical trinkets at section meetings and by printing and mailing the section's annual newsletters.

Invited addresses at the spring meeting

were "A Fast 'N' Best Optimal Assignment Algorithm with Applications to Multitarget Tracking," by Roy Danchick (Senior Staff Engineer, TRW); "Wiles' Proof of Fermat's Last Theorem," by Edward F. Schaefer (Santa Clara University); and "Eigenvalues of Finite Toeplitz Matrices," by Estelle Basor (California Polytechnic State University).

The 1994 Southern California Section Award for Distinguished College and University Teaching was awarded to Professor Mario U. Martelli (California State University, Fullerton).

**Southwestern** The annual meeting of the Southwestern Section of the MAA was held at Glendale Community College, Glendale, Arizona. Since this was a joint meeting with ArizMATYC and with the Arizona Mathematics Consortium, there was a nice mix of two-year and four-year college faculty. Friday morning, April 8th, the group enjoyed a talk by Carl Pomerance (MAA Pólya Lecturer). On Friday afternoon and Saturday morning were contributed paper sessions.

In conjunction with the Friday evening banquet, which was held on the new Arizona State University-West campus, the group toured the new campus and saw the electronic classrooms. The guest speaker at the banquet was Mutiara Bays, who combined mathematics and origami. Steve Shew (Glendale Community College) received the section's Distinguished Teacher Award. A tour of Glendale Community College's High-Tech Centers was a highlight of the meeting; many people left the conference with new ideas on using computers in the teaching of mathematics.

**Texas** The annual meeting of the Texas Section was held April 7-9 at Texas A&M University in College Station, Texas. Highlights of the meeting included the presentation of the section's Distinguished Service Award to Professor James R. Boone (Texas A&M University) and the presentation of the section's 1994 Distinguished College or University Teaching of Mathematics Award to Professor Montie G. Monzingo (Southern Methodist University).

There were forty-five contributed papers and eleven student papers at the meeting. In addition, Bert Waits (Ohio State University) led a short course on the use of

See *Sections* on page 33

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## PERSONAL OPINION

Time For  
Advancement

Mary Beth Ruskai

Because pre-college attrition is so high, discussions of underrepresentation of women in science, mathematics, or engineering often leave the impression that there is only a minor role for college faculty and research mathematicians. However, the number of women mathematicians has been substantial for many years. Not only have women received over 20% of the Ph.D.s in mathematics earned by U.S. citizens every year since 1982, but in recent years women have received nearly 50% of undergraduate and 25% of doctoral degrees in mathematics. Despite recent progress, there is evidence that women continue to advance more slowly than men, and are less likely to have their achievements recognized than men. During the last two years, as chair of the AMS-ASA-AWM-IMS-MAA-SIAM Joint Committee on Women in the Mathematical Sciences (JCW), I have reviewed a great deal of data. It has been a sobering experience to realize the extent of the disparity that remains.

I believe that mathematicians could do much more to advance the careers of junior women, and that this responsibility is shared by the entire mathematical community, men as well as women. Mentoring junior women should not be left to the increasing, but still overburdened, pool of senior women.

## Are Women Getting All the Jobs?

The current job crisis in mathematics has been accompanied by claims that women are getting a disproportionate share of the positions. The data tells a different story.

I have culled and summarized some data from the annual AMS-IMS-MAA data surveys. Table I shows the percent and number of women among Ph.D.s from different types of departments, while Table II shows corresponding data for those who received their first position at different types of institutions.<sup>1</sup> From 1988-92 the rate at which women were hired by doctorate-granting mathematics departments increased steadily until in 1991 it finally

Table I: Doctoral Degrees

## I.A. % of Women among those receiving degrees from

	I	II	III	I-III	IV	V	U.S. Cit	ALL
%F 81-90	15	18	21	17			25	20
%F 1991	16	21	21	18	29	21	24	20
%F 1992	17	20	29	20	27	21	24	21
%F 1993	22	22	24	22	28	26	28	24

## I.B. # of Women receiving degrees from

# in 1981-90	435	230	229	894			865	
# in 1991	70	39	29	138	49	33	112	220
# in 1992	73	38	39	150	46	27	103	223
# in 1993	95	42	44	181	65	40	145	286

reached that at which they received Ph.D.s from group I departments alone!<sup>2</sup> The group II (but not group III!) departments did sometimes hire at a higher rate, but only in years when the group I hiring rates were low. This suggests that the group II and III departments will hire women only if they can get group I women, but not if they have to settle for group II. Unpublished AMS data<sup>3</sup> giving further breakdowns confirms this—women are rarely hired into group II and III departments from groups II and III, although substantial numbers of men are. In 1993,

several things occurred simultaneously: the percent of women receiving Ph.D.s from group I departments jumped from a previous high of 17% to 22%; the distribution of women receiving Ph.D.s from groups I, II, and III was more uniform; groups II and III began to hire a few women from groups II and III as well as I, IV, and V; women were hired by doctoral institutions at a rate slightly (very slightly) higher than that at which they received Ph.D.s; and jobs were becoming increasingly scarce. The result was widespread claims of, "Women are getting all the jobs."<sup>4</sup>

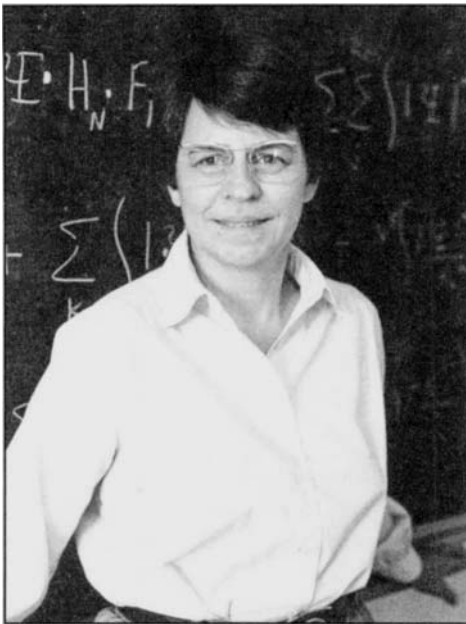
## A Personal Story

When I was a graduate student in the '60s, even the most insufferable male chauvinists never questioned my ability—no matter how inappropriate and perverted they regarded my study of science, they conceded that a woman who could survive in graduate school at Wisconsin was capable. In 1972, near the previous nadir of the job market, I reluctantly took a postdoctoral research position for the fourth consecutive year, but decided to seek and accept nothing less than a regular faculty position for the following year. Moreover, in the fall of 1972, Elliott Lieb and I completed the proof of the strong subadditivity of quantum mechanical entropy, a problem which we had worked on during my 1971-72 postdoc at MIT. This result, which had been an open conjecture for five years, had gained enough notoriety in some circles that its solution would be expected to make one competitive in most markets.

A few months later, a visitor was vociferously holding forth in the mathematics department lounge about the pressure to hire women. He alleged that his department had no women applicants and he would gladly create a position if someone like me applied. So I asked for the name of his university—it turned out that I had just received a rejection letter from his chair in the mail I opened before lunch!

In May, Rockefeller offered me a postdoc for which I had not even applied, but I still had no faculty offers. By June, I finally had a one-year position as Visiting Assistant Professor at the University of Oregon. Yet, when I reported the offer, one male mathematician said (to my face), "They must have been desperate to hire a woman." Nevertheless I enjoyed three years at Oregon, reaching the tenure-track level before deciding to move on.

Reasonable people may, of course, disagree about the relative merits of individuals for certain appointments. However, honest disagreements should not be distorted into tales of outrageous favoritism, and those who hear such anecdotes third- and fourth-hand should regard them with considerable skepticism. Moreover, the existing data does not show any evidence for systematic preferential treatment.



**Table II: First Position of New Doctorates by Type of Department**  
**II.A. % of Women among those receiving first position at**

	I-V+RI									
	I	II	III	I-III	IV	V	RI	D*	M	B
1988	13	26	7.5	14	26	0	17	15.5	18	20
1989	8	21	13	12	24	28	12	14.5	24	35
1990	12	16	19	15	31	22	9	16	19	18
1991	13	24	17	17	22.5	21	15	17.5	21	30
1992	21	17.5	12	18	8	57	16	18	18	30
1993	26	25	26	26	38	60	33	29	24	25
88-93	16	22	16	17	26	28	17	19	21	27

**II.B. # of Women receiving first position at**

	I-V+RI									
	I	II	III	I-III	IV	V	RI	D*	M	B
1988	11	11	4	26	9		3	38	14	14
1989	9	10	7	26	8	4	3	41	20	38
1990	12	8	13	33	10	4	3	50	16	19
1991	15	12	11	38	9	4	5	56	19	41
1992	23	7	6	36	2	4	10	52	15	42
1993	28	13	15	56	15	6	10	87	17	32

When, for perhaps the first time in history, women finally began to get their fair share (any excess being well within the limits of statistical fluctuations), some men began to cry “foul.”

The AMS also publishes data on new hires at all levels. The data for 1991 supports the hypothesis that group II hires women only if it can attract the kind of topnotch women group I has finally begun to recruit. True equality will be achieved not when the top mathematics departments finally have a few more tenured women, but when the group II departments stop recruiting group I caliber women and start hiring group II caliber women!

However, Table III also contains some striking data about the number of recruited positions which were not filled. In 1990,

91, and 92, the number of “unfilled” positions reported by both group II and group III departments was always greater than the number of women actually hired! The nature of these unfilled positions is unclear—they may have disappeared, or been filled late. In any case, factors other than competition from talented women are primarily responsible for whatever difficulties men currently encounter in finding jobs.<sup>5</sup>

### Where are Women Getting Jobs?

Women are far more likely to have positions at institutions with high teaching loads than at research-oriented Ph.D. institutions. While a great deal of attention has been focused on the lack of tenured women at “top ten” departments, only a few of the less prestigious departments do

much better. In fact, as shown in Table IV, the proportion of women among tenured faculty at groups I, II, and III was about 4%, 5%, 5.5%, respectively in 1991 and 1992. However, it jumps to 11-12% at master’s and 15% at bachelor’s departments. This differential is not simply a historical artifact; women continue to be disproportionately hired by bachelor’s institutions. In 1992 about 46% of tenured women mathematicians were at four-year colleges, as well as 46% of untenured women, i.e., both junior and senior women were equally likely to have positions at four-year colleges. By contrast, only 28% of tenured and 33% of untenured men were at such departments. Similar patterns hold for 1991 and 1993.

Is this disparity a result of a greater appreciation of the rewards of teaching at four-year colleges by women? This question cannot be answered until we are sure that every woman has the opportunity to pursue a mathematics career with the convex combination of teaching, research, and administration that is best suited to her talents and interests.

### But Are They Visible?

It is certainly heartening that many of the young women coming out of graduate school are finally getting the opportunity to begin their careers in good research departments. However, most of these positions are not tenure-track.<sup>6</sup> The substantial number of women who received Ph.D.s from 1975-88 is not reflected in the 5% of tenured women cur-

**Table III: New Doctoral Hires by Type of Department**

	I	II	III	I-III	IV	V	I-V	M	B
1990 Total # Hired	144	74	157	375	68	18	461	215	220
% F	13	16	16.5	15	22	17	16	23	20
# F	19	12	26	57	15	3	75	49	44
# Unfilled	24	17	32	73	18	2	93	46	42
1991 Total # Hired	170	73	131	375	61	19	455	220	402
% F	15	7	14	13	23	10.5	14	20	23
# F	26	5	18	49	14	2	65	45	94
# Unfilled	9	14	34	57	20	12	89	66	51
1992 Total # Hired	145	81	120	346	52	20	418	188	399
% F	18	23	16	18.5	21	10	18	27	28
# F	26	19	19	64	11	2	77	50	112
# Unfilled	7	21	25	53	19	3	75	36	47
1993 Total # Hired	163	65	152	380	62	30	472	233	331
% F	14	34	22	21	31	23	22	23	23
# F	23	22	33	78	19	7	104	53	77
# Unfilled	12	9	13	34	15	4	53	25	55

rently in doctoral departments. Will the women Ph.D.s of the '90s fare better, or will attrition also pare their ranks? Rather than taking a "wait and see" attitude, the mathematics community should actively promote the advancement of junior women into the senior research ranks.

Career advancement does not consist entirely in getting job opportunities at good research institutions, or even in publishing in top notch journals. Recognition and contacts also play an important role. Therefore, women mathematicians have long been concerned about the paucity of women speakers at mathematics research conferences. Although the situation is improving, there are still far too many conferences with no or few female speakers. The data summarized in Table V for AMS special sessions of invited twenty-minute talks illustrates one aspect of the problem. In sessions with only male organizers, 7–8% of speakers were female; in those with at least one female co-organizer, 15–16% of speakers were female. Careful examination of meeting programs and discussions with colleagues have convinced me that this pattern is typical of many other meetings, and is the result of the following phenomenon: Men tend to invite primarily well-established women who could also be hourlong speakers, while female organizers include more promising junior women and lesser luminaries. When junior women are overlooked, they may miss the exposure and contacts that are essential to professional growth and career advancement. However, it is not unusual for organizers to include junior (male) colleagues. In addition to including more senior women among the major speakers, organizers should seek out junior women who are beginning to contribute to an area, particularly if the meeting includes shorter talks.

But conferences are only one aspect of a larger problem. The research community should take a more active role in advancing the careers of promising junior women by suggesting them as speakers; inviting them to workshops at the various mathematics institutes; encouraging them to apply for grants and fellowships; giving savvy advice on grant proposals; nominating them for awards; etc. In other words, doing all the things that some advisors have always done for their best male students.<sup>7</sup>

**Table IV % Women among Tenured Doctoral Faculty\***

	I	II	III	I–III	IV	V	M	B
<b># of Depts</b>	<b>39</b>	<b>43</b>	<b>88</b>	<b>170</b>			<b>250</b>	<b>1000</b>
Fall 1991	4.2	5.2	5.5	5	7	3	11	14
Fall 1992	3.8	5.3	5.5	5	6	6	12	15
Fall 1993	4.9	5.9	6.5	6	6	5	11	15

\*Response rates are high (> 90%) for groups I–III, but significantly lower for groups IV, V, M, and B. Therefore, the extrapolated data groups IV, V, M, and B are less reliable and show greater fluctuations from year to year than that for groups I–III. However, figures are given to 0.1% for groups I–III solely to indicate trends, and not as an indication of accuracy.

#### References for Tables I–IV

The primary sources were the second reports of the annual AMS-IMS-MAA survey for the years 1988–1993. These were published in *Notices of the AMS* as follows:

1988, vol. 36 (May/June 1989): 533–538; 1989, vol. 37 (July/August 1990): 658–663; 1990, vol. 38 (May/June 1991): 411–417; 1991, vol. 39 (July/August 1992): 573–581; 1992, vol. 40 (July/August 1993): 601–609; 1993, vol. 41 (July/August 1994): 598–605.

Data in Tables I and II above come from the tables denoted 2A and/or 2B in these reports. Data in Table III above comes from the tables denoted 3B in the 1990–93 reports. Data in Table IV above comes from the tables denoted 3C and 3D in the 1991–93 reports. Additional data was obtained from the following articles in *Notices of the AMS*:

Jackson, A. "Top Producers of Women Mathematics Doctorates." 38 (September 91) 715–720. "1991 Annual AMS-MAA Survey (First Report)." 38 (November 1991): 1086–1094.

"1993 Annual AMS-IMS-MAA Survey (First Report)." 40 (November 1993): 1164–1171.

Because cultural factors inhibit many women from applying for awards or inviting themselves, it is particularly important that senior researchers nominate and encourage them.

Let me emphasize that I am not advocating differential standards, but an expansion of the existing network process to insure the inclusion of women. It is not at all unusual to find that including more women actually raised standards. The essence of my recommendation is simply to make a small but concerted effort to insure that promising women are not lost or overlooked. The current pool of mathematically talented young women is a vital resource which the mathematical community ought to do everything possible to develop. The existence of other pools of mathematical talent should not tempt us to squander this unprecedented opportunity, but challenge us to find ways of utilizing all the wealth.

#### What Should We Do Next?

Past experience has shown that the most modest effort inevitably produces some backlash. Despite the negative anecdote recounted in the box, I have also had many positive experiences and very supportive male colleagues. However, although I am convinced that the number of truly malicious and bigoted people is very small, I am also increasingly convinced that the

number willing to confront and fight them is comparably small. As a result, a small number of "bad guys" can have a disproportionately large effect. I doubt that affirmative action results directly in hiring more women; its utility is primarily as a tool for diminishing the effect of the malicious minority.

Only a few cases of hiring, promotion, speaker selection, etc. are really clear cut. We do not live in an ideal world where every decision can be based upon pure merit. Because most people have both good and bad points, detractors can always find something if they look. The difficulty is to distinguish between a bona fide criticism and an excuse to hide bigotry and double standards. Even when the "good guys" win, the process of airing and defeating irrelevant complaints can have a detrimental effect on a junior faculty member's career. I have seen too many young women falter either because no one bothered to provide a necessary "push" at critical times, or because detractors managed to prevail.

Some people will point out that similar things can happen to young men also, and there are certainly cases in which men, as well as women, have been unfairly treated. What I find unfortunate is that, instead of being a stimulus toward fairness, this observation often becomes an excuse to tolerate discrimination or double stan-

**Table V: AMS Special Sessions (Math Research)**

Meeting	Organizer	# of Women	Speakers	# of Total Speakers	% Women
<b>Jan 91 San Francisco</b>		22		244	9%
6 sessions	Wom Co-Org.	12		100	12%
8 sessions	Men Only	10		144	7%
<b>Jan 92 Baltimore</b>		18		206	9%
none	Wom Co-Org.		<i>omitted—teaching &amp; history only</i>		
12 sessions	Men Only	18		206	9%
<b>1992 Section Meetings</b>		69		812	9%
11 sessions	Wom Co-Org.	28		193	14%
41 sessions	Men Only	41		619	7%
<b>Jan 93 San Antonio</b>		40		404	10%
4 sessions	Wom Co-Org.	16		73	22%
17 sessions	Men Only	24		331	8%
<b>92 &amp; 93 Joint Summer Meeting</b>		25		340	8%
3 sessions	Wom Co-Org.	8		44	18%
21 sessions	Men Only	17		296	6%
<b>Jan 94 Cincinnati</b>		18		287	6%
3 sessions	Women Co-Org.	8		68	12%
12 sessions	Men	10		219	5%
<b>Total Above</b>		192		2293	8%
27 sessions	Women Co-Org.	72		478	15%
111 sessions	Men Only	120		1815	7%

Notes: Prepared from unpublished AMS data and/or a rough survey of meeting programs, both primarily using first name recognition with foreign names and initials assumed male unless recognized. Only math research sessions were included; those on history, undergraduate research, mathematics education, and meetings were excluded.

## A Consortium to Advance Women in Mathematics 1995

If funded by the NSF, a consortium of seven mathematics departments will begin offering special programs designed to encourage talented women undergraduates to pursue advanced degrees in the mathematical sciences.

**Summer Programs for Freshmen and Sophomores:** \* Carleton and St. Olaf Colleges will offer a four-week program to develop students' skills in conjecture, proof, and the use of mathematical software. \* SUNY Stony Brook's six-week program will involve each student in creative problem solving in both pure and applied mathematics.

**Summer Programs for Juniors:** \* The George Washington University will offer a six-week program of intensive short courses leading to interesting open problems. \* Mills College will continue to operate its successful six-week Summer Mathematics Institute, where students participate in intensive interactive seminars led exclusively by active women mathematicians. \* Mt. Holyoke College will offer an eight-week program in which small groups of students will work with faculty on research problems. \* The University of Michigan at Ann Arbor will operate an eight week research program in which each student will work one-on-one with faculty on ongoing projects.

**Junior Year at Chicago:** \* The University of Chicago will host promising students who wish to deepen and broaden their mathematical background in an intensive year of study in mathematics.

All seven programs will provide advice and information about graduate schools and careers in mathematics.

Instructors are urged to bring this announcement to the attention of their students. For more information and application materials, please send email to millssmi@ella.mills.edu or write to CAWM, c/o Summer Mathematics Institute, Mills College, Oakland, CA 94613.

dards. Senior faculty not only have a responsibility to be honest themselves, but to fight for their junior colleagues when necessary.

### References

<sup>1</sup>In these AMS-MAA reports, group I consists of the top 39 Ph.D.-granting math departments in the U.S.; groups II, the next 43, group III, the remaining doctoral math departments; group IV consists of statistics departments; and group V of doctoral programs in applied math and/or operations research. M and B denote departments which grant Master's and Bachelor's in mathematics respectively. The symbol RI is used for research institute (e.g., IAS or MSRI) and D denotes the combined total of I-V + RI, i.e., new doctorates whose first position was in a non-industrial research environment.

<sup>2</sup>Although excluding groups II and III Ph.D.s from the doctoral hiring pool may be justified, the actual hiring pool is somewhat higher than group I alone, since groups I and II do hire a significant number from group V, and group III from group IV.

<sup>3</sup>Don McClure, AMS-ASA-MAA data committee chair (1987-1993), sent the JCW a summary of this data.

<sup>4</sup>Jackson, A. "Jobs, Grants, and the New Ph.D." *Notices of the AMS* 40 (July/August 1993): 588-90; "Are Women Getting All the Jobs?" *Notices of the AMS* 41 (April 1994): 286-87.

<sup>5</sup>The NSF data bureau recently reported substantial increases in the number of foreign

scientists and engineers acquiring permanent residency in the U.S. in 1991 and 1992. Furthermore, nearly half of the scientists were classified as mathematicians and computer scientists by the Immigration and Naturalization Service. By contrast, NRC data indicate that mathematicians and computer scientists constitute less than 10% of doctoral scientists (20% if one excludes social scientists). One needn't be xenophobic or unappreciative of the contributions of foreign immigrant mathematicians to be concerned about this imbalance. Moreover, in view of anecdotal evidence that these immigrants were overwhelmingly male, it seems clear that the recent advances of junior women are an exceedingly minor factor in the current tight job market.

<sup>6</sup>The non-tenure-track positions range from prestigious research instructorships at top institutions to exploitive one- and two-year temporary positions. The large number of women in non-tenure-track positions is partly a consequence of their finally getting a higher share of the research instructorships. However, it is worth noting that in 1993 women held only 6% (10 of the 156) tenure-track positions at group I departments versus 19% (68 of 360) of the non-tenure-track positions.

<sup>7</sup>For those who want more detailed suggestions, see M.A. Olmstead, "Mentoring New Faculty: Advice to Department Chairs," *CSWP Gazette* 13 (August 1993), pp. 1, 8-11.

*Mary Beth Ruskai is a professor of mathematics at the University of Massachusetts in Lowell. Her e-mail address is bruska@cs.uml.edu.*

# CALCULUS REFORM: A RETROSPECTIVE

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As a young man at the Institute for Advanced Study in Princeton, Ralph Philip Boas, Jr., together with a group of other mathematicians, published a light-hearted article on the "mathematics of lion hunting" under a pseudonym (1938). This sparked a sequence of articles on the topic, several of which are drawn together in this book.

**Lion Hunting** includes an assortment of articles that show the many facets of this remarkable mathematician, editor, writer, and teacher. Along with a variety of his lighter mathematical papers, the collection includes Boas' verse and short stories, many of which are appearing for the first time. Anecdotes and recollections of his numerous experiences and of his work and meetings with many distinguished mathematicians and scientists of his day are also included.

The mathematical articles in this collection cover a range of topics. They include articles on infinite series, the mean value theorem, indeterminate forms, complex variables, inverse functions, extremal problems for polynomials, and more.

Boas' wit and playful humor are reflected in the verses included in this collection. The verses reflect the phases of his career as author, editor, teacher, department chair, and lover of literature. A section of the book describes the feud that Boas supposedly had with Bourbaki. Also included are many amusing anecdotes about famous mathematicians.

We profit from Boas' labor, and treasure it as an inheritance. We should allow ourselves in some measure to walk along his path. This collection will allow the reader a glimpse of that path.

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**Algebra and Tiling** is accessible to undergraduate mathematics majors, as most of the tools necessary to read the book are found in standard upper division algebra courses, but teachers, researchers and professional mathematicians will find the book equally appealing. Beginners will find the exercises and the material found in the appendices especially useful. The "Problems" section will appeal to both beginners and experts in the field. The book could serve as the basis of an undergraduate or graduate seminar, or a source of applications to enrich an algebra or geometry course.

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In August of 1986 a special conference on recreational mathematics was held at the University of Calgary to celebrate the founding of the Strens Collection. Leading practitioners of recreational mathematics from around the world gathered in Calgary to share with each other the joy and spirit of play that is to be found in recreational mathematics. Martin Gardner says of recreational mathematics: "I don't know of any better way to hook the interests of students."

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You will not soon find another collection of wonderful articles on recreational mathematics by a more distinguished group of authors. If you are interested in tessellations, Escher, tiling, Rubik's cube, pentominoes, games, puzzles, the arbelos, Henry Dudeney, or change ringing, then this book is a must for you.

If you believe that recreational mathematics must be the mathematics that is fun, then look no further, for **The Lighter Side of Mathematics** is full of fun.

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## All the Math That's Fit to Print

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Between 1983 and 1989 Keith Devlin, research mathematician, author, and educator, wrote a semi-monthly column on mathematics and computing in the English national daily newspaper, *The Manchester Guardian*. This book is a compilation of many of those articles. It is witty, entertaining, and easy to read.

The mathematical topics range from simple puzzles to deep results including open problems such as Faltings Theorem and the Riemann Conjecture. You will find articles on prime numbers, how to work out claims for traveling expenses, calculating pi, computer simulation, patterns and palindromes, cryptology, and much more.

This book is meant for browsing by anyone who regularly reads a serious newspaper and has some interest in matters scientific or mathematical. Keith Devlin tells us "from the mail I received I know that the readers of the column were a varied bunch. They ranged from students at schools in their early teens (occasionally even younger!), to retired people in their nineties (often the ones who best succeed in cracking the brain teasers I occasionally included in my articles); from prison inmates to executives in the computer industry; from truckers to schoolteachers; both men and women."

If you think that nothing of interest has happened in mathematics since the time of Pythagoras, this book will change your mind. Keith Devlin presents mathematics as a living human enterprise, both a science and an art.

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## Preparing for a New Calculus

Conference Proceedings

**Anita Solow, Editor**

Among the background papers presented at this 1993 conference are overviews of developmental projects in calculus reform, precalculus reform at the college level, and mathematics curriculum reform at the high school level. In addition, there are background papers on the current status and special problems and potential for curricular reform in community colleges, and in colleges with large proportions of minority students. The remaining two background papers summarize the results of the MAA Survey of the current state of calculus reform at the college level and changes in the AP Calculus Program.

The core of the meeting program was a series of four concurrent workshops on Content, Teaching Strategies, Institutional Context, and Course Context. Reports from each workshop form the second part of the volume. In these reports, each workshop group examines the future of the reform movement from the perspective of their topic.

The contributed papers, the third part of the volume, represent the best thinking on calculus and precalculus reform from those who are actively involved in the movement.

The fourth part of the volume is a collection of brief descriptions of a number of developmental projects in the calculus and precalculus reform movements. The listing of projects is a valuable resource providing helpful information about a diverse set of projects. **Preparing for a New Calculus** should be read by every mathematics educator who teaches at the calculus or precalculus level.

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## Assessing Calculus Reform Efforts

A Report to the Community

**James R. C. Leitzel and Alan C. Tucker, Editors**

**Assessing Calculus Reform Efforts: A Report to the Community** provides a review of various aspects of the calculus reform movement. This study gives an assessment of the current attitudes and involvement of mathematical sciences departments—their faculty and students—in efforts to revise calculus instruction.

A key finding of the assessment study is that *how* calculus is taught has changed more than *what* is taught. The changes in instructional practice, more frequent use of technology, and increased focus on building students' conceptual understanding are finding their way into both pre-calculus and post-calculus mathematics courses. This has encouraged increased interest in research about how undergraduate students learn mathematics. Many of the institutions that currently report using reform materials in experimental sections have plans to move their efforts to course-wide adoption in the near future. The fact that in the past two years over 95% of institutions using a reform text continue using a reform text the next year (for at least some sections) indicates that calculus reform is likely to be around for the foreseeable future.

Data is provided on the number of institutions at each of the levels of postsecondary education that are engaged in reform efforts and also given is information on faculty and student involvement and reviews of texts produced by some of the major curriculum development projects. The appendices to the report include brief descriptions of selected calculus reform texts and a complete listing of the NSF awards made during the seven years of the Calculus Initiative.

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*Gardner* from page 9

entire universe is made of matter, obviously. And matter is made of particles. It's made of electrons and neutrons and protons. So the entire universe is made out of particles. Now what are the particles made out of? They're not made out of anything. The only thing you can say about the reality of an electron is to cite its mathematical properties. So there's a sense in which matter has completely dissolved and what is left is just a mathematical structure. Mathematical structure has a reality of its own and it's independent of the human mind. Or, to put it another way, if intelligent beings were suddenly to disappear from the universe, the Andromeda galaxy would still have a spiral structure, whether anyone was observing it or not. Or, to put it in terms of number theory, if two dinosaurs met two other dinosaurs in a clearing, there would be four dinosaurs even though there would be no humans around to observe this event or to count, and even though the dinosaurs didn't know how to count. So this is the sense in which I think mathematics is independent of the human mind. There are a lot of mathematicians now who try to argue the reverse and make mathematics dependent on human culture. I simply can't understand what they're talking about when they say that.

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**Application forms must be received by March 3, 1995**

*Sections* from page 22

graphing calculators in calculus and differential equations courses, and Joe Lakey (University of Texas at Austin) offered a short course on wavelets. Department chairs, institutional representatives, two-year college faculty members, and MAA student chapter advisors and student representatives met in special sessions.

**Wisconsin** The annual meeting of the Wisconsin Section was held April 22-23, 1994 at the University of Wisconsin, Eau Claire, with 180 registrants, forty of whom were students. There was a large number of student papers, many the result of collaborative work among students. The section's first attempt at offering a student poster session was declared a success; although only four posters appeared, they were well-appreciated. The section also provided a pizza party for students as an alternative to the banquet, as the section has learned that students often do not enjoy the banquet; now students have a choice.

The section is proud of its work on building a program of high school and middle school mathematics contests in the State. It is continuing to encourage colleges and universities in the state to offer scholarships linked to achievement on the several mathematics contests. The section supports both the national mathematics contests and a statewide contest of its own.

### NAZARETH COLLEGE Department of Mathematics & Computer Science

Nazareth College invites applications for a tenure-track position in mathematics, effective Fall, 1995. Doctorate in mathematics or mathematics education, and demonstrated interest and excellence in teaching required. Responsibilities include 4 courses per semester (at various levels), and continued scholarly growth. Preference given to qualified candidates committed to the "reform" movement in undergraduate mathematics, and the preparation of mathematics teachers. Nazareth College is a thriving, independent, co-educational, liberal arts college with an undergraduate student body of approximately 1400. The College is located near Rochester, New York, the third largest city in the state. Rochester is noted for its cultural diversity. Salaries are competitive.

Send letters of application, resume, transcripts, and the names and addresses of three references to: Professor Nelson Rich, Nazareth College, 4245 East Avenue, Rochester, NY 14618-3790. E-mail: [rich@naz.edu](mailto:rich@naz.edu). Applications will be considered as received until the position is filled. EOE/AA.

### University of North Dakota Mathematics Department Grand Forks, ND 58202-8376

Applications are invited for an expected tenure-track position at the assistant professor level in one of the three areas, mathematics education, differential geometry or combinatorics, beginning August 16, 1995. Teaching loads are three courses per semester. Applicants must possess a strong commitment to teaching and research. Doctorate required. Salary and fringes competitive. In your letter of application, state clearly the area, of the above three, in which you are qualified. Send current CV, copy of transcripts and three letters of reference to: Selection Committee, Mathematics Department, University of North Dakota, P.O. Box 8376, Grand Forks, ND 58202-8376. Closing date: February 15, 1995.

### UNIVERSITY OF REDLANDS

The University of Redlands Department of Mathematics invites applications for a tenure-track position at the assistant professor level beginning September 1, 1995. Responsibilities include teaching six undergraduate courses per academic year, including computer-based courses; directing student research projects; and engaging in scholarly activity. Requirements for the position include the Ph.D. in mathematics (any area of specialization is acceptable) and evidence of excellence in and commitment to undergraduate teaching. We are seeking a person who is committed to meeting the educational needs of an increasingly diverse student population.

The University of Redlands is a selective, private, comprehensive university located in sunny Southern California. It enrolls 1500 undergraduates in liberal arts and sciences and in small

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Dr. Mary Scherer, Chair, Mathematics Search, Department of Mathematics, University of Redlands, P.O. Box 3080, Redlands, CA 92373-0999.

Application deadline is February 1, 1995. Department representatives will attend the AMS-MAA Joint Meetings in San Francisco, California, January 4 - 7, 1995. The University of Redlands is an Equal Opportunity employer, and especially encourages women and members of under-represented groups to apply, even if their career paths have been unconventional.

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### UNIVERSITY OF SOUTHERN COLORADO

**Department of Mathematics  
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Applications are invited for two tenure-track positions, each requiring a doctorate in mathematics. Candidates must demonstrate a strong commitment to excellence in teaching and teaching a culturally diverse student population. Strong communication skills are essential, and ongoing scholarly activities are expected. The University of Southern Colorado is building a multicultural faculty and strongly encourages applications from female and minority candidates. Send letter of application which includes a statement of professional goals, current resume, copy of graduate transcripts, and three letters of reference (two must comment on teaching) to Roger W. Johnson, Search and Screen Committee. Evaluation of applications will begin immediately and continue until positions are filled. USC is an AA/EO employer.

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### SCHOOL OF MATHEMATICS, UNIVERSITY OF MINNESOTA

Assistant Professor, Mathematics, 2-Year Temporary Position, for recent Ph.D.s especially interested in several areas of curriculum development and mathematics education in a major mathematics department. These areas include graduate training, undergraduate curriculum reform, and programs for mathematically gifted secondary school students. This position will be a 9-month, non-tenure track appointment with the School of Mathematics, with a 2-year initial period, and renewable for up to 2 additional years. Work under the supervision of the Director of the Mathematics Special Projects Office with the University's Talented Youth Mathematics Program (UMTYMP), departmental initiatives, and developing various grants. Projected salary \$32,000-\$34,000 for the academic year 9/1-6/15 depending on qualifications. Summer appointments on externally funded projects may be available. Responsibilities: Teaching undergradu-

ate and UMTYMP calculus component coursework. Work with the Director on undergraduate curriculum development and K-12, undergraduate and graduate programs and activities which are educationally innovative. Conduct research with the Director and senior staff leading to the publication of articles and materials related to these programs. Qualifications: Ph.D. degree in mathematics, with extensive teaching experience at the undergraduate level required. Research and publication experience and involvement in educationally related programs, and mathematics research publications desirable. Experience with innovative educational programs for talented secondary school students or undergraduates desirable. Send curriculum vitae, 3 letters of recommendation (including at least one letter detailing teaching experience and educational involvement), and statements on both teaching/educational and mathematical interest and background to Dr. Harvey B. Keynes, School of Mathematics, University of Minnesota, 127 Vincent Hall, 206 Church Street SE, Minneapolis, MN 55455-0487. Closing date for receipt of application 1/31/95. THE UNIVERSITY OF MINNESOTA IS AN EQUAL OPPORTUNITY EDUCATOR AND EMPLOYER.

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### Boston College - Department of Mathematics

Boston College invites nominations and applications for a tenured position in the Department of Mathematics at the level of Full, or possibly Associate, Professor. Qualifications include the Ph.D. in the mathematical sciences, a strong record of scholarship, and a commitment to teaching at the undergraduate and master's levels. An applicant's area of research should be compatible with those of the department; these include, but are not limited to, analysis, dynamical systems, number theory, probability and statistics, and topology. The position will be available on September 1, 1995.

Boston College is a Jesuit University, enrolling approximately ten thousand undergraduate and four thousand graduate students. The Department of Mathematics includes twenty-one full time faculty, and offers undergraduate programs in mathematics and computer science, as well as graduate programs leading to the MA and MST degrees in mathematics.

Applicants should submit a curriculum vitae along with a cover letter, and are invited to include names of references. Send all materials and inquiries to: W. J. Keane, Chair, Department of Mathematics, Boston College, Chestnut Hill, MA 02167; e-mail: keane@bc.edu. Review of applications and nominations will begin on January 1, 1995, and continue until the position is filled.

Boston College is an Affirmative Action/Equal Opportunity employer.

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### Saint Peter's College Department of Mathematics

Saint Peter's College, an urban Catholic Jesuit Institution, is located in Jersey City, New Jersey.

It has an undergraduate enrollment of approximately 2000 full-time students and 1200 part-time students. It also has a branch campus in Englewood Cliffs devoted primarily to adult learners. The normal teaching load is 12 credits per semester. The Mathematics Department has a full-time position available beginning in August, 1995. Duties include teaching undergraduate mathematics courses, including some developmental courses. A Master's degree is required; a Doctorate is required for tenure. Preference will be given to candidates with experience in probability or in analysis. The position is contingent on budget approval. The review of applications will begin on February 1, 1995, and will continue until the position is filled. Send a letter of application and a curriculum vitae to Search Committee, Mathematics Department, Saint Peter's College, Jersey City, NJ 07306. Please enclose a self-addressed, stamped postcard for acknowledgment of your application. Saint Peter's College is an EO/AA employer and complies with Title IX of the Education Amendments of 1972 and with Section 504 of the Rehabilitation Act of 1973.

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### SUNY GENESEO

Two year, tenured track position (Inst. Asst. Prof.) open Fall 1995. Experience in and commitment to excellence in undergraduate teaching. Ph.D. preferred. Specialty: applied mathematics. Closing date: Feb. 1, 1995. Send: vita, three letters of recommendation, transcripts, statement of teaching philosophy to Donald Thrasher, SUNY, 1 College Circle, Geneseo, NY 14454. AA/EOE. Women and minorities are encouraged to apply.

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### The University of Montana Department of Mathematical Sciences

The Department of Mathematical Sciences has openings for two tenure-track Assistant Professors beginning Fall 1995. One position each in Operations Research and Statistics are available. A doctorate in Mathematical Sciences and a commitment to excellence in teaching and research are required. Research must be compatible with interests of current faculty members in the department in Operations Research and Statistics. The department offers B.A., M.A., M.A.T., and Ph.D. degrees in several areas of mathematics. A longer job description may be obtained by anonymous ftp at ftphost.umt.edu in the subdirectory /pub/math (read 'readme' first) or by calling the phone number below. Applications (including resume, graduate transcripts, and 3 letters of recommendation) should be sent to: Don Loftsgaarden, Chair, Department of Mathematical Sciences, University of Montana, Missoula, MT 59812. Phone: (406) 243-4171, e-mail: ma\_dol@selway.umt.edu (questions only). Screening of applicants will begin on January 16, 1995, and continue until the positions are filled. The University of Montana is an equal opportunity/affirmative action employer.

### Moorhead State University

Tenure-track position at rank of assistant professor to begin September, 1995. A Ph.D. or Ed.D. in mathematics education is strongly preferred. Substantial progress towards terminal degree is required. Eligibility for licensure at some level K-12 and good communication skills are required. Preference will be given to candidates with evidence of successful teaching experience at the K-12 and college level. Interest or experience in teaching a mathematics methods course for the elementary education majors and evidence of ability to work effectively as a member of a teaching team are desirable. Duties include teaching mathematics education methods courses, elementary education content courses, and undergraduate mathematics courses. Other responsibilities include advising secondary mathematics education majors, developing in-service workshops, working on assigned committees, and maintaining an appropriate level of professional activity. The teaching load is twelve hours per semester, which may include supervising student teachers. Screening of applications will begin January 20, 1995. Completed applications must include a resume, MSU Standard Application Form, graduate and undergraduate transcripts, and three letters of reference. Apply to Ronald Jeppson, Chair, Mathematics Department, Moorhead State University, Moorhead, Minnesota 56563, (218) 236-2274. Moorhead State is an equal opportunity/affirmative action employer and educator.

### GUILFORD COLLEGE

#### Department of Mathematics Greensboro, North Carolina

Tenure-track position in mathematics at a selective Quaker affiliated liberal arts college of approximately 1600 students. Applicants must be enthusiastic about teaching service courses (especially elementary statistics) and a wide range of courses in the major, and should have interdisciplinary teaching interests as well. They also need to be enthusiastic about teaching students with diverse mathematical preparations and abilities, and about promoting undergraduate research with capable students. Candidates must have completed, or be near completion of the Ph.D. in mathematics (all specialties considered) and should show evidence of an active continuing research program. Three courses per semester is the standard teaching load. Applicants should send AMS Application Cover Sheet, letter describing teaching interests and philosophy, vita, transcripts, and three recommendations to George R. Gordh, Jr., Department of Mathematics, Guilford College, Greensboro, NC 27410. Application materials should be sent by January 9, 1995 to ensure full consideration. Women and minorities are encouraged to apply. AA/EOE.

### TENNESSEE TECHNOLOGICAL UNIVERSITY

#### Department of Mathematics

Applications are invited for a tenure-track position at the rank of Assistant Professor, available

August 1995. Ph.D. in mathematics in the area of combinatorics, graph theory, optimization, or control, evidence of excellent teaching ability, and strong interest in research are required. Duties include teaching undergraduate and graduate courses, engaging in research activities, participating in course and curriculum development, and directing graduate students. Initial screening of applications will begin on January 10, but the position will remain open until filled. Send transcripts and curriculum vitae, and have three letters of recommendation sent to:

Prof. Brian M. O'Connor  
Search Committee Chairperson  
Department of Mathematics  
Box 5054  
Tennessee Technological University  
Cookeville, TN 38505  
FAX: (615) 372-6172  
e-mail: boc3530@ntech.edu  
AN AA/EEO/ADA EMPLOYER

### Elon College

Applications are invited for one or two permanent positions at the assistant professor level. Applicants must hold a Ph.D. in Mathematics by the effective date of appointment, August 1995. A strong commitment to teaching at the undergraduate level is required. Preference will be given to candidates with experience in teaching and a demonstrated interest in curriculum development. Evidence of experience in statistics, applied mathematics and interdisciplinary study is desired. Elon is a private, liberal arts college with 3500 students located between Greensboro and Burlington, within an hour's drive of several colleges and research universities. The mathematics department has 10 full-time faculty members and 45 undergraduate majors. A representative will be attending and interviewing at the San Francisco AMS/MAA meetings in January 1995. Applicants interested in being interviewed should submit their applications by December 15, 1994. Otherwise applications will be reviewed beginning on January 20, 1995. Send letter of application, vita, undergraduate and graduate transcripts, and three letters of reference to: Dr. Rosalind Reichard, Associate Dean for Academic Affairs, Campus Box 2163, Elon College, NC 27244. Minority and women candidates are encouraged to apply. Elon is an EOE institution.

### MATHEMATICS POSITION

#### Specialty in Mathematics Education Sam Houston State University

The Division of Mathematical and Informational Sciences is seeking applicants for a tenure-track position for a specialist in mathematics education. Rank and salary are negotiable. Applicants should have the equivalent of a master's degree in mathematics and hold a doctorate in mathematics or mathematics education. The successful candidate will possess the interest and ability to develop and teach mathematics content courses for prospective teachers. Preference will be given to persons who have a strong background in

mathematics and have a record of or show potential for in-service teacher education, grant procurement, research, and publication.

Sam Houston State University has a strong tradition of quality in mathematics teacher education, providing a variety of innovative programs for preservice and in-service teachers of mathematics at the elementary, secondary, and two-year college levels. An unusually cooperative relationship exists with the Department of Curriculum and Instruction, which offers complementary course work in professional education. Division curricula include computer science, mathematics, and statistics. Undergraduate and graduate major and minor programs in mathematics with supporting courses in computer science and statistics are offered for prospective secondary school teachers. In addition, the Division offers mathematics minors at the BS and M.Ed. levels for elementary school teachers. A preservice MA program for two-year college mathematics faculty is available. Sam Houston State University, a member of the Texas State University System, with 96 undergraduate, 76 graduate, and one doctoral program, is one of the larger state-assisted institutions of higher education in Texas. Approximately 13,000 students and 500 full- and part-time faculty enjoy the advantages of picturesque Huntsville, Texas (rated as one of the best small cities in America), and close proximity to the Houston Metroplex, 60 miles south of campus.

Review of applications will begin on January 15, 1995, and continue until the position is filled. To apply, submit a letter of application, full curriculum vitae, transcripts, and three letters of reference to: Professor Ronald A. Stoltenberg, Mathematics Education Search Committee, Sam Houston State University, Huntsville, Texas 77341-2206. Sam Houston State University is an Equal Opportunity and Affirmative Action Employer. Women and members of minority groups are encouraged to apply.

### OHIO UNIVERSITY

#### Department of Mathematics

The Department of Mathematics is accepting applications for the position of tenure-track assistant professor in the field of mathematics education. The position begins September 1, 1995. The candidate must be qualified to teach courses entitled "Teaching of Mathematics in Secondary Schools," and "The History of Mathematics." The candidate should also be able to supervise the mathematics sequence for elementary education majors. The salary is competitive and there is an excellent benefits package. Applicants must have a Ph.D. in either mathematics or mathematics education before September 1, 1995. Send resume and three letters of recommendation to Mary Anne Swardson, Chair, Department of Mathematics, Ohio University, Athens, Ohio 45701. The deadline for applications is January 31, 1995. Ohio University is an Equal Opportunity/Affirmative Action Employer.

### Northeast Missouri State University

Three positions are expected to be available in August 1995: tenure-track Assistant or Associate Professor of Mathematics Education, tenure-track Assistant Professor of Mathematics, and temporary Instructor. Tenure-track positions required appropriate doctoral degrees or expected completion dates prior to August 31, 1995; Instructor positions require at least a masters degree. Candidates for the Mathematics Education position should have the commitment and ability to continue the development of an excellent, innovative graduate program preparing secondary teachers. This involves supervising interns and requires substantial driving. For the tenure-track mathematics position, an interest in teaching numerical analysis or computer science is preferred, but not required. Teaching loads are nine semester hours for tenure-track positions, twelve hours for instructors. Candidates should supply evidence of potential for excellence in teaching, advising, research, and service appropriate for the position they seek. Applicants should send a vita, statement of teaching philosophy, transcripts of undergraduate and graduate study, and three letters of reference to Dr. Eric Howard, Division Head, Mathematics and Computer Science, Northeast Missouri State University, Kirksville, MO 63501. Review of applications will begin January 16, 1995 and continue until the positions are filled. Northeast is a highly selective public liberal arts and sciences university and an AA/EO/ADA employer.

### DÉPARTEMENT DE MATHÉMATIQUES ET DE STATISTIQUE UNIVERSITÉ LAVAL

#### POSTE POUR LE BACCALAURÉAT EN ENSEIGNEMENT SECONDAIRE (MATHÉMATIQUES)

Le Département de mathématiques et de statistique sollicite des candidatures pour un poste de carrière spécialement consacré au baccalauréat en enseignement secondaire (voies mathématiques). L'ENTRÉE EN FONCTION EST LE 1<sup>ER</sup> JUIN 1995.

fonctions La fonction principale de la personne recrutée sera d'enseigner des cours de mathématiques destinés aux étudiants du baccalauréat en enseignement secondaire et d'effectuer toute tâche universitaire en relation avec ce programme.

Elle devra faire de la recherche et pourra être requise pour effectuer d'autres tâches universitaires, notamment l'enseignement d'autres cours et la supervision d'étudiants des deuxième et troisième cycles.

Critères de Sélection Détenir un doctorat en mathématiques ou un diplôme jugé équivalents. Les candidatures des personnes qui sont proches d'obtenir un doctorat seront également considérées. Faire la preuve, à la satisfaction du

comité de sélection, de son intérêt pour la formation des maîtres du secondaire en mathématiques et de sa capacité à donner des cours de mathématiques adaptés aux futurs enseignants du secondaire.

Avoir la capacité de faire de la recherche en mathématiques.

Pouvoir enseigner en français.

Seront considérés comme des atouts: - une bonne connaissance du système d'enseignement secondaire au Québec, - la capacité à intégrer dans une des équipes de recherche existantes de département, - une formation complémentaire dans un domaine lié à l'enseignement secondaire. INFORMATION L'Université Laval applique un programme d'accès à l'égalité qui consacre la moitié des postes vacants à l'engagement des femmes. Les candidatures féminines et les candidatures de jeunes présentant un grand potentiel sont particulièrement encouragées. Conformément aux exigences prescrites en matière d'immigration au Canada, la priorité sera accordée aux citoyens canadiens et aux résidents permanents du Canada. Le salaire est déterminé par le convention collective suivant l'ancienneté et le rang universitaire accordés. Les personnes intéressées sont priées de faire parvenir, avant le 31 janvier 1995, à l'adresse cidessous, une copie de leur curriculum vitae, des triés-à-part de quelques publications récents ou tout autre travail de recherche et deux lettres de recommandation témoignant de leurs aptitudes professionnelles tant en recherche qu'en enseignement. Claude Lemaire, Directeur Département de mathématiques et de statistique Université Laval Sainte-Foy (Québec) Canada G1K 7P4

### Western Carolina University Department of Mathematics and Computer Science

Assistant/Associate Professor tenure-track position, beginning August 1995. Ph.D. in mathematics required. M.S. or B.S. degree in computer science will enhance application. Duties include teaching mathematics courses from freshman through master's levels and possibly computer science courses. Excellence in teaching and continued scholarly activity are expected. Send resume, transcripts, three reference letters to: Lee Minor, Coordinator MATH SEARCH COMMITTEE, Dept. of Mathematics & CS, Western Carolina University, Cullowhee, NC 28723. Send inquiries to: MINORL@wcu.edu. Deliberations on completed applications will begin January 6, 1995; later applications will be accepted until position is filled. AA/EOE.

### Denison University Mathematics and Computer Science Department Granville, OH 43023

The department invites applications for a tenure-eligible position at the rank of assistant professor beginning fall 1995. Candidates must hold or

anticipate a doctorate in mathematics and masters-level competency in computer science or a doctorate in computer science and masters-level competency in mathematics. The successful candidate is expected to be able to offer some upper-level courses in computer science and introductory courses in both areas. The department is searching for a person who is an excellent teacher and has a strong commitment to the liberal arts. Continued excellence in teaching and research are required for tenure.

Please have a letter of application, vita, and three letters of recommendation, at least one of which addresses teaching, sent to the chair of the department. Review of applications will start 1 February 1995 and will continue until the position is filled. As an AA/EOE employer, Denison encourages women and people of color to apply.

### Northern Kentucky University Department of Mathematics and Computer Science

Tenure-track position in mathematics beginning August, 1995, pending funding. Doctorate in a mathematical science required. Quality teaching, continued scholarly activity, and service required. Good oral and written communication skills mandatory. Will teach a wide range of undergraduate mathematics courses. Normal teaching load is twelve hours/semester. Send letter of application, curriculum vitae, transcripts or summary of graduate work, and three letters of recommendation to: Dr. Gail Wells, Chair of Search Committee, Department of Mathematics/Computer Science, Northern Kentucky University, Highland Heights, KY 41099-1700. Applications reviewed as received; interviews begin February 15, 1995. NKU is located seven miles from Cincinnati, Ohio and enrolls approximately 12,000 students. The Department of Mathematics and Computer Science, with 200 computer science majors and 100 mathematics majors, offers courses in mathematics, computer science, and statistics. NKU is an AA/EOE actively seeking the candidacy of minorities and women.

### Dartmouth College

The Department of Mathematics has an opening for a tenure-track Assistant Professor in Modern Analysis, with initial appointment in the 1995-1996 academic year. A candidate for the position must be committed to outstanding teaching at all levels of the undergraduate and graduate curriculum and must give evidence of a well-regarded research program that shows real promise for the future. Candidates with several years of experience should in addition be ready to direct Ph.D. theses. To create an atmosphere supportive of research, Dartmouth offers new faculty members grants for research-related expenses, a quarter of sabbatical leave for each three academic years in residence and flexible scheduling of teaching responsibilities. The teaching responsibility in mathematics is four courses spread over two or three quarters. The department encourages good

teaching with a combination of committed colleagues and bright, responsive students. Though first priority is to appoint a modern analyst, our second priority is a mathematical statistician with strong interests in signal processing. Exceptional circumstances could lead to making the appointment in some third field or at a higher level than assistant professor. To apply, send a letter of application, curriculum vitae, and a brief statement of research results and interests. Also arrange for four letters of reference to be sent, at least one of which addresses teaching, and, if the applicant's native language is not English, the applicant's ability to use English in a classroom. All application materials should be addressed to Betty Harrington, Recruiting Secretary, Department of Mathematics, 6188 Bradley Hall, Dartmouth College, Hanover, NH 03755-3551. Applications completed by February 1 will receive first consideration. Dartmouth is committed to Affirmative Action and encourages applications from African Americans, Asian Americans, Hispanics, Native Americans, and women. Inquiries about the progress of the selection process can be directed to C. Dwight Lahr, Recruiting Chair.

### Dartmouth College

#### John Wesley Young Research Instructorship in Mathematics

The John Wesley Young Research Instructorship in Mathematics is a two-year post-doctoral appointment for promising new or recent Ph.D.s whose research interests overlap a department member's. Current departmental interests include areas in algebra, analysis, combinatorics, computer science, differential geometry, logic and set theory, number theory, probability and topology. Teaching duties of four ten-week courses spread over two or three quarters typically include at least one course in the instructor's specialty and include elementary, advanced and (at instructor's option) graduate courses. Nine-month salary of \$35,000 supplemented by summer (resident) research stipend of \$7,778 (two-ninths). Send letter of application, resume, graduate transcripts, thesis abstract, description of other research activities and interests if appropriate, and 3 or preferably 4 letters of recommendation (at least one should discuss teaching) to Betty Harrington, Department of Mathematics, 6188 Bradley Hall, Hanover, NH 03755-3551. Applications received by Jan. 15 receive first consideration; applications will be accepted until position is filled. Dartmouth College is committed to affirmative action and strongly encourages applications from minorities and women.

### SUNY-Farmingdale

**Director of the Mathematics Center and Assistant Professor of Mathematics** - fall 1995 anticipated tenure-track vacancy-to direct the operations of a mathematics learning center and to teach a 1/2 load. Teaching responsibilities will range from remedial through all levels of undergraduate mathematics. The Department

emphasizes teaching however, scholarship and service is expected. Minimum qualifications: Doctorate in mathematics, mathematics education, or operations research; demonstrable computer skills, sufficient to use the Center's software. Preference will be given to candidates who have experience directing a mathematics learning center. Consideration will be given to candidates who expect to complete all degree requirements by August 15, 1995 (essential for appointment). Correspondence must identify the title of the position. Letter of application and resume, including the names and telephone numbers of three references (no letters of reference, please) must be received by JANUARY 20, 1995. Address correspondence to: Dr. Robert V. Mark, Dean, School of Arts and Sciences, Box B, State University of New York, College of Technology, Farmingdale, NY 11735. The College is an Equal Opportunity/Affirmative Action Employer.

### Continuing Position Department of Mathematics Southern Illinois University at Carbondale Carbondale, Illinois 62901

Applications are invited from qualified candidates for a tenure-track position at the assistant professor level beginning on August 16, 1995. Ph.D. in mathematics required. Preference will be given to applicants in the areas of algebra, combinatorics, ordinary or partial differential equations, probability and topology. Candidates must have demonstrated excellence in research or potential for such. Applicants should provide evidence of excellence in teaching, and foreign applicants must provide evidence of the ability to teach in English effectively. Send letter of application, resume, and three letters of recommendation to: Continuing Position c/o Ronald B. Kirk, Chair, Department of Mathematics, Southern Illinois University at Carbondale, Carbondale, Illinois 62901 The closing date is December 1, 1994 or until the position is filled. SIUC IS AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION EMPLOYER. Women and minorities are particularly encouraged to apply.

Mesa State College announces two tenure-track positions in Mathematics at the Assistant or Associate Professor level beginning mid-August 1995. Required are an earned doctorate in mathematics by May 1995; a demonstrated ability to provide high quality teaching in lower division, upper division, and developmental levels; strong interest in integration of new mathematical technology; and a commitment to campus service and professional development. Preference will be given for outstanding teaching at the college level. Consideration will be given for graduate teaching assistantships with sole responsibility. Good communication skills are also required. Commensurate with education, experience and rank, anticipated salary would be in the low \$30,000. Send application package (letter of application, statement of teaching philosophy, resume, tran-

script of doctoral studies, and three letters of recommendation) to: Edwin Hawkins, Chair, Department of Computer Science, Math, and Engineering, Mesa State College, P.O. Box 2647, Grand Junction, CO 81502, (303) 248-1654. To insure consideration, the entire application package should be received by January 18, 1995. Mesa State College is an AA/EOE employer. Mesa State College is a drug-free workplace. All employees of the College must agree to abide by our drug-free policy as a condition of employment.

### Computer Science, Meredith College

Assistant/Associate Professor and Director of Computer Science. Ph.D. in Computer Science or Computer Information Systems; a strong interest in teaching; a commitment to undergraduate liberal arts and computer science education. Meredith College is a church-related women's college with a stable environment of about 2000 students. Apply to Dr. Virginia Knight, Department of Mathematics and Computer Science, Meredith College, 3800 Hillsborough St., Raleigh, NC 27607; inquiries to vknight@mercury.interpath.net. Meredith College is an Equal Opportunity Employer; women and minorities are encouraged to apply.

### Franklin & Marshall College Lancaster, PA 17604-3003

#### Assistant Professor of Mathematics

#### Visiting Assistant Professor of Mathematics

Undergraduate mathematics department has a tenure-track entry-level position and a visiting position renewable for two or three years, starting Fall 1995. Ph.D. expected by Sept. 1995. For tenure-track job, preference will be given to candidates specializing in algebra, number theory or discrete math. Teaching: 5 courses per year. Continued scholarly activity expected. Send resume; graduate and undergraduate transcripts; four letters of recommendation, two of which address teaching ability; list of courses taught, including applicant's responsibilities and AMS Application Cover Sheet to: Alan Levine, Chair. The deadline for the tenure-track position is January 20, 1995. Consideration for the visiting position begins January 20; applications accepted until position filled. Franklin & Marshall is committed to cultural pluralism and strongly encourages applications from minorities and women. EOE/AA.

### Franklin & Marshall College, Dept. of Mathematics

#### Lancaster, PA 17604-3003

#### Assistant Professor of Mathematics and Computer Science

Tenure-track entry-level position in undergraduate mathematics department starting Fall 1995. Ph.D. expected by Sept. 1995. Teaching: 5 courses per year in mathematics or 4 courses in computer science. Continued scholarly activity expected. Send resume; graduate and undergraduate transcripts; four letters of recommendation, one addressing teaching ability in computer science

and one in mathematics; list of courses taught, including applicant's responsibilities and plan for future research to: Professor Jay Anderson, by January 20, 1995. Franklin & Marshall is committed to cultural pluralism and strongly encourages applications from minorities and women. EOE/AA.

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**Murray State University  
Department of Mathematics  
& Statistics**

Applications are invited for a tenure-track position in mathematics education starting August 1, 1995. Candidates must have a doctorate in mathematics or a doctorate in mathematics education with at least a masters degree in mathematics, in-hand, by starting date. Evidence of outstanding teaching, a successful record of scholarly activity or the potential for continued scholarly activity, and a strong commitment to teacher education are required. Responsibilities include a maximum three courses teaching load, continuing research/scholarly activities, and university/departmental service. The person who fills this position will teach a range of mathematics courses, including content and method courses for prospective K-12 teachers, seek external funding to conduct workshops and seminars for public school teachers, and work in collaboration with public schools to help implement the Kentucky Education Reform Act. The application package must include a letter of application, vita, copies of graduate transcripts, and a statement which addresses the applicant's experience and interest within the field of mathematics education. The immigration status of non-U.S. Citizens should be indicated on the vita. All applicants must meet federal guidelines for working in the U.S. For full consideration, applications must be completed by December 16, 1994. Send the application package and direct three letters of recommendation to:

Dr. Robert Pervine, Search Committee Chair  
Department of Mathematics and Statistics  
Murray State University  
P.O. Box 9  
Murray, KY 42071-0009

Murray State University is an equal education and employment opportunity M/F/D AA employer.

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**Mathematics, Assistant Professor,  
Tenure-track**

An anticipated opening for Fall 1995 to teach the full range of math courses from algebra through calculus, and in area of expertise. Ph.D. required. Excellence in teaching and current classroom pedagogy, academic advising, and the ability to direct undergraduate research are essential for the successful applicant. Send vita, letter of application, official transcripts, and names/addresses of three references by January 15, 1995 to: Dr. Richard Melka, Mathematics Search Committee, University of Pittsburgh at Bradford, 300 Campus Drive, Bradford, PA 16701. AA/EOE.

**The University of Akron  
Department of Mathematical Sciences  
Instructor or Assistant Professor**

An Instructor or Assistant Professor (tenure-track) position available in January 1995. Primary responsibilities involve general education, more specifically the coordination and teaching of Mathematics for Elementary Teachers and College Algebra courses. Applicants should possess at least a Masters degree in mathematics or mathematics education. The university offers competitive salaries and excellent fringe benefits. The University of Akron is the third largest state university in Ohio. The department offers a Bachelors degree in mathematics, applied mathematics, computer science and statistics, and a Masters degree in mathematics, applied mathematics, and statistics. All material (application letter, curriculum vitae, unofficial copy of graduate transcripts, and three letters of reference) should be sent to: Dr. Neal C. Raber, Chair, Mathematics Search, Department of Mathematical Sciences, The University of Akron, Akron, OH 44325-4002. Review of completed applications will begin November 15, 1994, and continue until the position is filled. Women and minorities are encouraged to apply. The University of Akron is an equal education and employment institution.

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**Bowdoin College  
Brunswick, Maine 04011**

Mathematics Department: Tenure-track Assistant Professorship starting Fall, 1995. Initial appointment for three years with renewal possible. Seeking candidates with primary research interests in one of the following fields: operations research, mathematical economics, numerical analysis, or geometry (AMS subject classification numbers 51, 52, 53, 65, or 90). Ph.D. required and strong research record or potential expected. Normal teaching load is two courses per semester. A record of superior undergraduate teaching is expected. Review of candidates begins December 1, 1994, but applications will be considered until position is filled. Send completed AMS application cover sheet, resume, and 3 letters of recommendation to James E. Ward, Chair, Department of Mathematics, Bowdoin College, Brunswick, ME 04011. Include e-mail address. Bowdoin College is committed to equal opportunity through affirmative action. Women and members of minority groups are urged to apply and invited to identify themselves as such.

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**Saint Michael's College  
Department of Mathematics  
Colchester, Vermont**

Applications are invited for a tenure-track position at the Assistant Professor level to begin Fall 1995. Qualifications: Ph.D. in Mathematics or Statistics; evidence of the potential for excellence in undergraduate teaching; commitment to scholarly activity. Preference given to candidates with expertise in Statistics, Applied Mathematics, or fields which can be made accessible to undergraduates. Saint Michael's is a selective, Catholic

liberal arts and sciences college of 1700 students located near Burlington, Vermont. Duties include teaching 3 courses per semester, research or professional development in mathematics, and service to the department and the college. Send application, including resume and 3 letters of recommendation, at least one which addresses teaching, to Dr. Z Kadas, Chair, Department of Mathematics, Saint Michael's College, Colchester, VT 05439. Screening of applicants begins December 15, 1994, and continues until the position is filled. SAINT MICHAEL'S COLLEGE IS AN AFFIRMATIVE ACTION/EQUAL OPPORTUNITY EMPLOYER.

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**Mathematicians. Iterated Systems, Inc.,** the global leader in fractal image compression, is seeking mathematicians for challenging research on fractal image compression. Graduate work in mathematics, knowledge of fractal geometry, and C programming skills required. Understanding of image science and C++ an advantage. ISI offers competitive salary and comprehensive benefits. For consideration, send resume to: Iterated Systems, Inc., Suite 650, Dept. MFB1094, 5550 Peachtree Parkway, Norcross, GA 30092 or e-mail: jobsearch@iterated.com. FAX: (404) 840-0029. We will respond only to candidates selected for an interview. An Equal Opportunity Employer M/F/D/V.

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**The University of Scranton  
Mathematics Department**

The University of Scranton, a Jesuit university with over 3,500 undergraduates, anticipates an opening in the academic year 1994-95 for an entry level assistant professor of mathematics, tenure-track. Applications are invited from qualified candidates seeking a teaching environment where research is encouraged and supported. Applicants should have a doctorate in mathematics or near completion. We are especially interested in individuals able to teach Probability/Statistics, Applied Mathematics, or Mathematics Education. Submit a vita, copies of transcripts, and three letters of recommendation attesting to teaching and research ability to Mathematics Faculty Search Committee, University of Scranton, Scranton, PA 18510-4666 or phone (717) 941-4233. The Department will be interviewing at the San Francisco meeting Employment Register in January. The University of Scranton is an Affirmative Action/Equal Opportunity Employer.

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**High-school level mathematics teacher,** pre-algebra through calculus, also to assist with physics and chemistry at an innovative private boarding school in central Oregon. Minimum 2-3 years classroom teaching experience required. Assertive individuals possessing solid leadership and counseling skills to work closely with students. Send resume to: Mt. Bachelor Academy, 246301 E. Hwy 26, Prineville, OR 97754 Attn: Personnel Director. FAX (503) 462-3430.

**Assistant Professor of Mathematics**

Grand Valley State University, an institution committed to teaching excellence, solicits applications for a tenure-track assistant professorship to begin August 1995. Doctorate in an area related to the teaching of mathematics required. Candidates should have a sincere desire to teach courses from prealgebra through precalculus with opportunities to teach in the area of math education. Candidates must have a strong mathematical background. A complete application must include a cover letter, vita, a copy of graduate transcripts, at least three letters of recommendation (at least two of which focus on the applicant's teaching ability and potential), and a personal statement that addresses the applicant's teaching philosophy, and experience with and expectations regarding the use of technology in teaching at this level. Send these materials to: Faculty Search Committee Department of Mathematics and Statistics, Grand Valley State University, Allendale, MI 49401. Applications will be accepted until January 13, 1995. EEO/AA/ADA.

**Assistant Professor of Mathematics**

Grand Valley State University, an institution committed to teaching excellence, solicits applications for a tenure-track assistant professorship to begin August 1995. Ph.D. in mathematics required. Applications from individuals working in all areas of mathematics will be considered, but preference shall be given to applicants working in the areas of discrete mathematics, operations research, dynamical systems, or applied mathematics. Responsibilities include teaching twelve hours per week at the level of precalculus and above, maintaining an active program of professional development, and student advising. A complete application must include a cover letter and vita, a copy of graduate transcripts, at least three letters of recommendation (at least two of which focus on the applicant's teaching ability and potential), and a personal statement that addresses the applicant's teaching philosophy, experience with and expectations regarding the use of technology in teaching, and experience with and/or interest in conducting a program of undergraduate research. Send these materials to: Faculty Search Committee Department of Mathematics and Statistics Grand Valley State University Allendale, MI 49401 Applications will be accepted until January 13, 1995. EEO/AA/ADA.

**University of California, Irvine**

Associate Professor in  
Mathematics Education  
Associate Professor in  
Educational Technology

The University of California, Irvine, seeks applicants for two tenured Associate Professorships in the Department of Education for the 1995-96 academic year. Candidates should be broadly knowledgeable scholar/researchers with a Ph.D. in a relevant field and a strong coherent record of publication in refereed journals. UCI is a leading

research institution on a modern campus with one of the most ethnically diverse student bodies in the nation. Persons with an intrinsic commitment to, knowledge of, and familiarity with diversity issues are strongly encouraged to apply.

**Associate Professor in Mathematics Education:** Expert in applying modern technology to the learning and teaching of mathematics in K-12 classrooms. Should be committed to qualitative and quantitative research methods.

**Associate Professor in Educational Technology:** Expert in instructional designs for educational software, including software tools built upon constructivist learning models. Should be committed to experimental evaluation designs. Successful applicants will employ theoretically grounded research in the service of school reform, will teach and carry out a program of research and scholarly work in education, and will contribute to the development of new graduate degree programs for teachers and educational researchers. The Department is particularly noted for its strength in educational technology.

**To Apply:** Send resume with a complete list of publications and reports; three recent publications; and names, addresses, and telephone numbers of four persons who can provide recommendations if the Department requests them to Dr. Henry Jay Becker, Chair of the Search Committee, Department of Education, University of California, Irvine, CA 92717-5500. Deadline for receipt of applications is December 31, 1994.

The University of California is an Affirmative Action/Equal Opportunity Employer committed to excellence through diversity.

**Whittier College**

The Department of Mathematics invites applications for a tenure-track position, assistant professor level, to teach undergraduate mathematics courses beginning Fall 1995. Qualifications: Ph.D. in Mathematics (completed by summer of 1995), evidence of quality teaching, and potential for scholarly growth. Preference will be given to candidates with experience in teaching undergraduate courses, with an appreciation for liberal arts education, and whose expertise complements current faculty. The department offers a major in

Mathematics with 3 different emphases: Pure Mathematics, Applied Mathematics, and Teaching Credential in Mathematics. Faculty members take turns teaching all courses in the department and participate in teaching college-wide courses such as Freshman Writing Seminars and other interdepartmental courses. Send cover letter, curriculum vitae, statement of teaching philosophy, and three letters of recommendation to Dr. Sharad Keny, Chair, Department of Mathematics, Whittier College, P.O. Box 634, Whittier, California 90608. Review of completed applications will begin on January 15, 1995. Whittier College is an EO/AEE.

**University of Oklahoma****Chair, Department of Mathematics**

Nominations and applications are invited for the position of Chair of the Department of Mathematics. The appointment is to be effective by the start of the Fall 1995 semester or earlier. Candidates must possess an earned doctorate, a substantial record of research achievement, a commitment to excellence in teaching, and leadership and administrative abilities appropriate to a department that is dedicated to a balanced program of quality research and teaching. The Mathematics Department has over 30 faculty and approximately 70 graduate students. There are active research programs in a wide range of topics. The scientific activity of the Department is further enhanced by a substantial endowment for discretionary funds. The Department offers programs for the bachelor's, master's, and Ph.D. degrees. Candidates should send a cover letter, vita, selected reprints, and names and addresses of four referees (at least one of whom could address the candidate's administrative abilities) to:

Dr. Paul Goodey, Chair Search Committee  
Department of Mathematics  
University of Oklahoma  
Norman, Oklahoma 73019-0315

Screening will begin on November 1, 1994, and continue until the position is filled.

The University of Oklahoma is an Equal Opportunity/Affirmative Action Employer. Women and minorities are encouraged to apply. OU has a policy of being responsive to the needs of dual-career couples.

**Teaching Undergraduate Women Headed for a Ph.D.**

If funded by the NSF, a Consortium of seven institutions will begin in 1995 to teach talented women undergraduates selected nationally, in summer programs designed to help motivate and prepare them to head for Ph.D. degrees in the mathematical sciences. Four of these (at Carleton and St. Olaf Colleges, SUNY Stony Brook, The George Washington University, and Mills College) may employ women mathematicians to teach in their programs; dates, subjects, and levels of students may vary.

The Consortium is setting up a registry of women mathematicians who wish to be considered for such positions. For further details please send email to millssmi@ella.mills.edu or write to CAWM, c/o Summer Mathematics Institute, Mills College, Oakland, CA 94613.

# Calendar

## National MAA Meetings

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

**August 6-8, 1995** Seventieth Annual Joint Summer Meeting. University of Vermont-Burlington, Burlington, VT

## Sectional MAA Meetings

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

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

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

**INDIANA** March 31-April 1, 1995, Tri-State University, Angola, IN

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

**IOWA** April 21-22, 1995, University of Northern Iowa, Cedar Falls, IA

**KANSAS** April 14-15, 1995, Wichita State University, Wichita, KS

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

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

**MD-DC-VA** April 7-8, 1995, Thomas Nelson Community College, Hampton, VA

**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

**NORTH CENTRAL** April 21-22, 1995, Carleton College, Northfield, MN

**NORTHEASTERN** June 9-10, 1995, Bates College, Lewiston, ME

**NORTHERN CALIFORNIA** October 21-22, 1995, Cal Polytech State University, San Luis Obispo, CA (joint meeting with S. California Section)

**OKLAHOMA-ARKANSAS** March 31-April 1, 1995, Southwestern Oklahoma State Univ., Weatherford, OK

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

**ROCKY MOUNTAIN** April 21-22, 1995, University of Southern Colorado, Pueblo, CO

**SEAWAY** April 21-22, 1995, Hobart & William Smith Colleges, Geneva, NY

**SOUTHEASTERN** March 31-April 1, 1995, University of North Carolina-Asheville

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

**SOUTHERN CALIFORNIA** October 21-22, 1995, Cal Polytech State University, San Luis Obispo, CA (joint meeting with N. California Section)

**TEXAS** March 30, 31, April 1, 1995, Baylor University, Waco, TX

**WISCONSIN** April 7-8, 1995, University of Wisconsin-Green Bay, Green Bay, WI

## Other Meetings

**April 20-22, 1995** Thirtieth Biennial Kappa Mu Epsilon (Math Honor Society) National Convention, Fort Lewis College, Durango, CO. For more information, contact Arnold Hammel, Central Michigan University, Mt. Pleasant, MI 48859; (517) 774-3543.

**February 8-11, 1995** Sixth SIAM Conference on Mathematical and Computational Issues in the Deosciences, San Antonio, TX. For more information, contact SIAM Conference Coordinator, (215) 389-7999, e-mail: meetings@siam.org.

**August 14-20, 1995** Symmetry: Natural and Artificial Third Interdisciplinary Symmetry Congress and Exhibition, Washington, D.C. (Old Town Alexandria). Contact: Gyorgy Darvas, Symmetrion - The Institute for Advanced Symmetry Studies, P.O. Box 4, Budapest, H-1361 Hungary; tel: +36-1-131-8326; fax: +36-1-131-3161; e-mail: h492dar@ella.hu; Denes Nagy, Institute of Applied Physics, University of Tsukuba, Tsukuba Science City, Japan 305; tel: +81-298-53-6786; fax: +81-298-53-5205; e-mail: nagy@kafka.bk.tsukuba.ac.jp .

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## DECEMBER 1994

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