FOCUS is published by the Mathematical Association of America in January, February, March, April, May/June, August/September, October, November, and December.

Editor: Fernando Gouvêa, Colby College; fqgouvea@colby.edu

Managing Editor: Carol Baxter, MAA cbaxter@maa.org

Senior Writer: Harry Waldman, MAA hwaldman@maa.org

Please address advertising inquiries to: Carol Baxter, MAA; cbaxter@maa.org

President: Ronald L. Graham

First Vice-President: Carl C. Cowen, **Second Vice-President:** Joseph A. Gallian, **Secretary:** Martha J. Siegel, **Associate Secretary:** James J. Tattersall, **Treasurer:** John W. Kenelly

Executive Director: Tina H. Straley

Associate Executive Director and Director of Publications and Electronic Services: Donald J. Albers

FOCUS Editorial Board: Rob Bradley; J. Kevin Colligan; Sharon Cutler Ross; Joe Gallian; Jackie Giles; Maeve McCarthy; Colm Mulcahy; Peter Renz; Annie Selden; Hortensia Soto-Johnson; Ravi Vakil.

Letters to the editor should be addressed to Fernando Gouvêa, Colby College, Dept. of Mathematics, Waterville, ME 04901, or by email to fqgouvea@colby.edu.

Subscription and membership questions should be directed to the MAA Customer Service Center, 800-331-1622; e-mail: maahq@maa.org; (301) 617-7800 (outside U.S. and Canada); fax: (301) 206-9789.

Periodicals postage paid at Washington, DC and additional mailing offices. **Postmaster:** Send address changes to FOCUS, Mathematical Association of America, P.O. Box 90973, Washington, DC 20090-0973.

ISSN: 0731-2040; Printed in the United States of America.

FOCUS

August/September 2003

Volume 23 Issue 6

Inside

On the cover: Elvis working on his math paper. Photo courtesy of Tim Pennings.

FOCUS Deadlines

	November	December	January
Editorial Copy	September 16	October 16	November 14
Display Ads	September 24	October 29	November 26

Jean-Pierre Serre Is First Abel Laureate

The first Abel Prize in Mathematics was awarded to French mathematician Jean-Pierre Serre. At a formal ceremony on June 3, King Harald of Norway presented the award, honoring Serre "for playing a key role in shaping the modern form of many parts of mathematics, including topology, algebraic geometry, and number theory." The awards ceremony was part of a week full of special events related to mathematics. Events included the laying of a wreath at the monument in honor of Niels Henrik Abel, the Abel Lecture by Serre ("Prime Numbers, Equations and Modular Forms"), and the Abel symposium, which included lectures by several mathematicians, including Barry Mazur and Peter Sarnak. A "Math Carnival" was held at the Universitetsplassen, in Central Oslo, with the participation of many children aged 10 to 12. Serre was present to hand out prizes to the winners of mathematical competitions.

Jean-Pierre Serre receiving the Abel Prize from King Harald of Norway.

Jean-Pierre Serre, who is Emeritus Professor at the Collège de France, in Paris, is noted both for his mathematics and for his expository skills. He has made fundamental contributions to topology, number theory, and algebraic geometry. He has also written many books and is famous for the clarity and penetration of his writing.

The Abel Prize, which was established in January 2002 and is awarded annually to recognize outstanding achievement in mathematics, carries a cash award of 6 million Norwegian kroner, which comes out to about $800,000. The prize is named for Niels Henrik Abel, who lived in Norway in the early 19th century and is recognized as one of the most brilliant mathematicians of his time. The Abel Prize is administered by the Norwegian Academy of Science and Letters, which has appointed an Abel Committee consisting of five mathematicians to review the nominated candidates and submit a recommendation for a worthy Abel laureate.

For more about the Abel Prize and about Jean-Pierre Serre, visit the Abel Prize website at http://www.abelprisen.no/index_english.html. Among other things, the site includes a well-written expository account of Serre's work. ■

About Jean-Pierre Serre

By Fernando Q. Gouvêa

Most good college and university libraries own many volumes of collected papers by various mathematicians, but few of these volumes ever make it into private book collections. Buying what is usually an expensive set of books is something one only does if the works in question are so useful that one knows they will be opened and read again and again. Thus, it is an indication of how valuable Serre's work is to note that all four volumes of his collected works are on my shelves—the only living mathematician whose collected works I have felt I absolutely needed to buy. Next to them are a volume of summaries of seminars, a volume of correspondence, and at least eight other books, several of which I have studied in detail.

Serre's work focuses mostly on three areas: topology, algebraic geometry, and number theory. In all three fields, he has had a formative impact, changing the very shape of the subject. Some of his papers are cited so often that they are known by nicknames: for example, GAGA ("Geométrie Algébrique et Geométrie Analytique"), FAC ("Faisceaux Algébriques Coherents"), and "Serre's Duke paper" ("Sur les représentations modulaires de degré 2 de $\mathrm{Gal}(\overline{\mathbf{Q}}/\mathbf{Q})$," published in the *Duke Mathematical Journal*). The last is particularly famous; in it, Serre formulated a far-reaching conjecture connecting modular forms and Galois representations, a small part of which was the core of Wiles' proof of Fermat's Last Theorem. Serre calls it his paper *pour optimistes*.

In addition to his research work, Serre has written many books, some at an advanced level, others more accessible. His writing is famous for being clean, efficient, and easy to understand. This side of his work was recognized by the AMS a few years ago, when it awarded him a Steele prize for exposition.

In addition to his work at the Collège de France, Serre was a frequent visitor to American universities. He spent a semester at Harvard while I was a graduate student there. It was then common knowledge among the graduate students that Serre's presence had a positive effect on the department: his courses were exciting, his ping-pong was top-notch, and the wine at the Friday afternoon wine-and-cheese parties was noticeably better.

Jean-Pierre Serre

Asked by a French news magazine whether being a great mathematician required genius, Serre replied that it was above all a question of taste: a taste for mathematics itself, and good taste in choosing the right mathematical problems. In fact, the first Abel Laureate has both taste *and* genius. ■

Photos courtesy of: The Abel Prize website: http://www.abelprisen.no/presse/

Elvis: Optimizing My Opportunities

As told to Tim Pennings

Hi. I'm Elvis. I got my name because as a nursing puppy I gyrated my back legs in a motion similar to my namesake, the King of Rock and Roll. As with Presley, I love the spotlight, from posing for a camera to diving into an eager crowd of high school students.

I knew that I was destined for fame, but when I went to live with mathematics professor, Tim Pennings, two years ago, I could see that my opportunities were limited. Nice guy, but not star quality, if you know what I mean. Then one fine day playing fetch at the beach, I had an inspiration: Show him that I have an instinctual knack for calculus by choosing the quickest path to the ball. (I have trouble with symbolic manipulation, but max-min problems come naturally to me.) It took him a few weeks to catch on, but when he did we researched and wrote the paper and I knew that I was on my way to the top.

With my smile gracing the front cover of the May issue of *The College Mathematics Journal*, what would come next? Well, first several local papers wrote stories, including two with headlines and front page pictures. Then *The Chicago Tribune* and *The Baltimore Sun* followed suit. ABCNEWS.com called for an interview and ran me as their top story, just ahead of the Microsoft-AOL merger. (And Bill Gates thought that HE was top dog!)

Elvis relaxing at home in between interviews and persona l appearances. Photo courtesy of Tim Pennings.

The BBC found out about me and called for a live on-the-air interview, as did our own country's NPR radio. Finally, we had an offer to go to Los Angeles for a spot on an NBC daytime talk show in August. (I was all for it, but my co-author would rather go camping.) All together we gave nine interviews and appeared in 28 news stories of various types.

All of this press led to some fine letters from dog lovers including one from a sincere elderly woman who described her Rottweiler's ability to solve algebraic formulas and do square roots. As for myself, I'll stick to calculus, and look forward to us giving our talk in various high schools and colleges next fall. Those students are just suckers for my handsome face. ■

Tim Pennings is an Associate Professor of Mathematics at Hope College in Holland, Michigan. His research, done collaboratively with undergraduate students, is in dynamical systems and modeling. He also directs the Hope College NSF-REU Mathematics Summer Research Program. Other reasons for living include ultimate frisbee, racquetball, nature photography, choral music, folk song guitar gigs, and playing with Elvis at the beach.

Don Albers, the MAA's Associate Executive Director, John dePillis, author of 777 Mathematical Conversation Starters*, and Lisette dePillis met Jay Leno after the Tonight Show aired on April 21, 2003. Leno likes mathematics and Albers and dePillis talked with him about Elvis and getting more math on the Tonight Show. Photo courtesy of The Tonight Show.*

Alder Awards Will Recognize Talented Beginning Teachers

Before his recent death, Henry Alder endowed a new MAA teaching award, to be known as the Henry L. Alder Award for Distinguished Teaching by Beginning College or University Mathematics Faculty. The awards "are to be made to college or university faculty who have taught full time in a mathematical science in the United States or Canada for at least two but not more than seven years since receiving their Ph.D. and whose teaching has been extraordinarily successful. Their effectiveness in teaching undergraduate mathematics must be documented and shown to have influence beyond their own classroom."

Nominations for the first Alder Awards should be sent to Martha Siegel at the Department of Mathematics, Towson University, 8000 York Rd., Towson, MD 21252-0001 by December 15, 2003. Contact Linda Sons, chair of the Alder Awards Committee, with any other questions. Sons can be reached at the Department of Mathematical Sciences, Northern Illinois University, DeKalb, IL 60115, by phone at 815-753-6760, or by email at sons@math.niu.edu.

Alder Award Description

In January 2003 the MAA established the Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member to honor beginning college or university faculty whose teaching has been extra ordinarily successful and whose effectiveness in teaching undergraduate mathematics is shown to have influence beyond their own classrooms. An awardee must have taught full time in a mathematical science in the United States or Canada for at least two, but not more than seven, years since receiving the Ph.D. Each year at most three college or university teachers are to be honored with this national award and are to receive $1,000 and a certificate of recognition from the MAA. Award recipients will be expected to make a presentation at one of the national meetings of the MAA.

Nominations for the award may be made by any member of the MAA or by any section of the MAA.

Alder Award Eligibility and Guidelines for Nomination

Eligibility

Nominees must:

Hold the Ph.D. degree

Be college or university teachers who have taught full time in a mathematical science in the United States or Canada for at least two, but not more than seven, years since receiving the Ph.D.

Hold membership in the Mathematical Association of America

Guidelines for nomination

Nominees for the award may be made by any member of the MAA or by any section of the MAA

Nominees should:

Be recognized as extraordinarily successful in their teaching

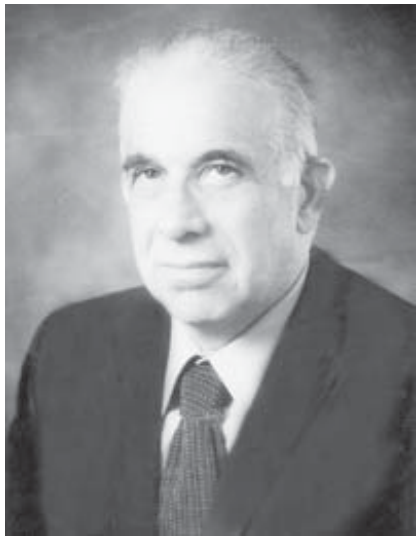
Have effectiveness in teaching undergraduate mathematics that can be documented

Have had influence in their teaching beyond their own classrooms

Interpretive notes

In determining eligibility, we do not count time spent in a postdoctoral position where nearly all the nominee's time was spent on research, and the nominee did very little or no teaching (e.g. three semester courses a year or less).

Teaching is intended to include classroom instruction as well as activities outside the classroom, such as working with student groups, preparing students



Henry Alder

for mathematical competitions, directing undergraduate students in research in mathematics, directing students in the preparation of honors theses, preparing teaching materials used by others, etc.

Nominations must be submitted according to the **Nomination Form**. Instructions for that form should be followed precisely to assure uniformity in the selection process.

The **Nomination Form** and a **Nomination Packet** that provides evidence documenting extraordinary success in teaching should be submitted to the Secretary of the MAA by December 15 of the academic year in which the nomination is to be considered. Directions for the nomination packet should be followed with precision to assure uniformity in the selection process. Nomination forms and further information can be found online at http://www.maa.org/news/062703alder.html.

One Day as Washington Lobbyists

By Jason L. Haun, Kelly A. Peck and Richard B. Thompson

This year the MAA sponsored the University of Arizona's *Mathematics for Business Decisions* project on a tour of congressional offices and at the CNSF Exhibition and Reception. On June 17, 2003 we spent a fascinating day as Washington lobbyists for the mathematical community for both research and education. Those of us participating found it to be a surprisingly rewarding day. More than lobbying, we were sharing very important information with members of Congress. And yes, seeing how government works was fascinating. Our preparation for promoting National Science Foundation funding and our observations from Washington may offer some insights into the mechanics of gaining support for mathematics.

The **Coalition for National Science Funding** (CNSF) is an alliance of universities and major professional societies from many areas of science, mathematics, and engineering. Its purpose is to encourage funding for the National Science Foundation. A major part of this endeavor is an annual exhibition and reception for members of Congress and their staff. Each coalition member may present a project that has received NSF support. Each year the MAA sponsors a project that highlights funding for undergraduate mathematics education and provides additional support for the reception.

This year the MAA chose us and the *Mathematics for Business Decisions* course to be their exhibitors. The course was developed by myself, Richard Thompson, of the University of Arizona Department of Math, along with my colleague Chris Lamoureux of the University of Arizona Department of Finance. Jason Haun and Kelly Peck are students who have been through the course. Each was very excited to be invited

Thompson, Kolbe, Haun, & Peck

to join me on this trip to Washington, D.C.

Mathematics for Business Decisions is a two-semester sequence of mathematics courses for undergraduate business majors that has been developed at the University of Arizona, with partial support from the NSF. It is now published and distributed by the MAA as self-contained electronic texts. The MAA chose this

Albers, Straley, Thompson, Haun, & Peck

project for its innovation in both content and delivery and its ready appeal to the public.

In Washington, we were escorted by Tina Straley, Executive Director of the MAA, on half-hour visits to the offices of five congressmen from the Arizona delegation. In the evening the MAA's Associate Executive Director, Don Albers, helped us set up a display booth at an exhibition and reception in the Rayburn Office Building. It was one of 30 presentations that were viewed by over 270 attendees from House, Senate, and White House offices. The MAA exhibit attracted one of the most important guests to the exhibit: Congressman Jim Kolbe (R, Tucson), who is a member of the House Appropriations Committee. Representative Kolbe came especially to meet with us, as he had promised he would.

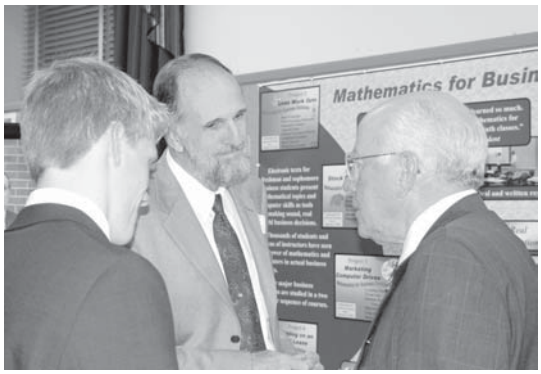
As a mathematician and co-author of *Mathematics for Business Decisions*, I prepared materials for our exhibit and invited two of our students, Kelly Peck and Jason Haun, to join me on the trip.

We wanted our exhibit to make a good impression. The MAA supported travel and the distribution of CD's and color brochures, and The University of Arizona supported the production of a 4′ x 6′ laminated color display poster. The MAA rented a 37″ plasma video monitor as part of their exhibit space. In the intense competition for Washington dollars, a low quality presentation is perceived as reflecting the value of the cause that it promotes. People were notably impressed with the professional appearance of our materials.

Congressmen and their staffers really do care about young people and students. Comments by Jason and Kelly held people's attention during both the office visits and at the exhibition. A copy of a course project report by Kelly commanded more interest than did some of our descriptive material. In fact, our only copy of the report went home with Representative Kolbe since we did not really want to ask him to give it back. The follow-up e-mails that I have received all mention the outstanding quality of our students. It is, of course, possible that this favorable impression is related to the fact that I managed to invite two outstanding, articulate young people!

Our scheduled office visits all had the same format. Tina Straley would thank the congressman for past NSF support

and ask for continued support, especially for the effort to double NSF's budget over a five-year period. She explained that The University of Arizona project that the MAA was presenting represented one type of work that had received funding. She suggested that Congress might not be as familiar with funding for undergraduate education as it is with research dollars. I would then give a brief explanation of the e-texts, and ask the students for their reactions to the program.



Haun, Thompson, & Ehlers

On most occasions when I discuss our project I am talking to other mathematicians who share my background in, and appreciation of, mathematics. In short, I am usually preaching to the choir. Public officials cannot be assumed to share our views of mathematics.

My approach to congressmen was based on the assumptions that they care about students in their home districts, that they want a work force which is competitive in the world market, and that they see technology as a key to the future. Reflecting these, I mentioned that *Mathematics for Business Decisions* is built around the topics, project structure, teamwork, and computer skills that are actually used in business. I was careful to work in the name of a local community college or university in the representative's home district and to note that students who can use mathematics effectively will be the ones who create jobs and expand the local tax base. These ideas resonated well with most of the congressmen, eliciting some very perceptive responses.

Several representatives mentioned the specific courses (ranging from Algebra II to Calculus) where mathematics had disconnected from the real world and stopped having meaning to them. Our program's continual contact with students' goals and interests was seen as highly desirable. In some cases, congressmen actually suggested ideas, such as extending our program to areas other than business and implementing our approach in high schools, for further exploration. They recognized that a major effort would be required and that much instructor preparation would be necessary to implement the agenda. These ideas brought us back to the need for continued NSF support and funding.

Our display at the evening exhibition drew attention from quite a few people, leading to discussions of NSF funding and of our project. We had a nice visit with Congressman Vernon Ehlers (R, Grand Rapids). He is a member of the House Committee on Science who also holds a Ph.D. in physics. Representative Ehlers has been a strong supporter of the National Science Foundation.

Jason Haun: One needs to make contact with several congressional offices in order to be heard. I constantly encounter ideas and complaints from people around me. However, in most cases their words are never heard by Congress. Due to this incredible opportunity offered by Professor Thompson and the Mathematical Association of America I was able to be heard and show my support for something in which I truly believe, "the future of education." Education is constantly changing and it is our duty, as citizens, to make sure that these changes propel the system in the right direction. Laws go through the governmental structure. However, "officials" act as liaisons to voice the views of citizens within their communities. It is the citizens' ultimate duty to make sure that their words are heard. In the world today, this may mean building a team of people who share common beliefs and then going to Washington.

This is only the beginning. The next step lies in making a direct connection with the person to whom you are speaking. He or she must begin to feel and believe in the same way that you do. Once this connection is made, change and innovation can take place. I want to thank everyone at the MAA as well as everyone who has worked with the *Mathematics for Business Decisions* program.

Kelly Peck: It is not every day that you get an invitation to go to Washington, D.C. with an agenda that includes meeting personally with Arizona Congressmen. Yet, here I am, a 20-year-old college student who is able to say that I have "been there, done that." The whole experience went by in a flash, but I walked away from it with some treasured memories.

Having virtually no knowledge of political procedures, I was quite surprised to see how things ran at the congressional offices. When speaking with congressmen, whose days are packed, you immediately learn how to get your point across as concisely as possible. I had to learn to condense two semester's worth of *Mathematics for Business Decisions* into a few minutes, and hope that I could maintain the representative's attention. It was definitely a learning experience, to say the least.

The beautiful Washington cityscape also left a lasting impression. I was awed by the grand historic buildings and their classical features. Perhaps even more impressive was the fact that the entire city is surrounded by, and engulfed in, luscious greenery—something considered a luxury by Arizonans.

In addition to the experience and the scenery, I will forever remember the people. Tina Straley, Don Albers, and the other MAA members I met were extremely friendly and accommodating. They became familiar faces in an unfamiliar place. Unfortunately, the trip went by way too fast. Upon leaving Washington, there was one thing I knew for certain: I would be back. ■

Photographs by Sharon L. Thompson. Information on the CNSF can be found at http://www.cnsfweb.org. Information on Mathematics for Business Decisions can be found at http://www.maa.org *and* http://business.math.arizona.edu/MBD/mbd.html.

MAA Tour of Greece

Thirty members (and guests) of the MAA traveled to Greece in late May to participate in the first MAA Study Tour abroad. There was a wide variety of participants, from high school teachers to retired professors, including two former presidents of the MAA as well as the current and former executive directors. All agreed that the trip met, and even exceeded, their expectations. Five of them agreed to write brief comments for FOCUS about their experiences.

From Joel and Linda Haack
University of Northern Iowa,
Cedar Falls, IA:

There were quite a few reasons that we were eager to participate on the MAA Study Tour of Greece. First, of course, as I have been teaching the history of mathematics for parts of the past 15 years, I was very eager to see Athens, Delphi, Miletus, and Samos. Second, there are a few places in the world that my wife Linda and I have always wanted to see. Greece has been one of those, ever since learning about it in our ancient history class way back in ninth grade. Finally, this trip provided us the perfect occasion to celebrate our thirtieth wedding anniversary.

The focus on mathematics and the sponsorship by the MAA set this trip apart from other tours we've taken. The pre-travel readings and videos increased my interest in Epidauros and the Eupalinos Tunnel. The mathematical presentations that were arranged at various sites in Greece were a pleasure. We were treated as mathematical ambassadors from the USA at several receptions, and in fact we did carry out those responsibilities throughout our trip. Talking with colleagues from Greece was enlightening. Because of the special interests of our group, the aegis of the MAA, the hard work of those putting the trip together, and some serendipity, we had the chance to visit the Academy of Athens and three Greek universities, see and hear the model of the ancient Greek harmonium, attend a special museum exhibit entitled "Is There a Solution for Everything? A Journey to the World of Greek Mathematics," receive guided tours of sites in Athens and on Samos by archaeologists from the region, and visit Miletus. All those on the trip were pleasant and responsible, creating an atmosphere of general good will that was a delight. And, the fellow travelers included previous acquaintances and new friends that we can expect to see again in the future.

One of the special treats for me on this trip was the chance to see and experience sites that would not normally be included in a tour of Greece, in particular the ancient harmonium, the visit to Miletus, and the time spent on Samos. (Parenthetically, a word about Miletus: its inclusion on our trip was one of the reasons I was excited to participate. The chance to see where Thales walked and created what are regarded as the first proofs in mathematics, the creation of the theoretical mathematics that we claim as ours, was an opportunity that I'd likely have on no other tour. Thank you for including it!)

Victor Katz and Lisa Kolbe, tour organizers, at the Acropolis.

Finally, an insight from Linda: this trip was of such great interest to even the non-mathematicians because so much of the focus was on mathematics and its relation to other disciplines: architecture, art, music, philosophy, mythology, history, astronomy, etc.

The Academy of Athens

Temple at Delphi

From Julius Barbanel
Union College,
Schenectady, NY:

Over the past few years, I have become quite fascinated with ancient Greek mathematics. When I heard about the MAA trip to Greece, I knew this was for me. It was a great trip, combining lectures on ancient Greek mathematics and travel to some marvelous sites.

My favorite three lectures were on ancient Greek astronomy, the mathematics of Plato's Academy, and the *Method* of Archimedes. The Greek mathematicians that we met were very welcoming and kind. They all seemed delighted to host a group of visiting mathematicians from the United States.

Tour participants at the Statue of Pythagoras in Pythagoreion, Samos.

We saw some marvelous sites. Some of the high points for me were: Delphi, where the ancient oracle used to dispense her wisdom; Olympia, site of the original Olympic Games; and the ancient city of Mycenae, the oldest site of all, home of the civilization about which Homer wrote in the *Iliad*.

Greece is a beautiful country. I'll always remember the gorgeous mountains, the beautiful sea, the vibrant people, and, of course, the great food. I wish I could do it all over again. What a joy this was!

From Genevieve Knight
Coppin State University,
Baltimore, MD:

My trip to Greece was one of the most rewarding activities that I have experienced in both my personal and professional life. The planners carefully arranged an exceptional mix of mathematics, Greek history, mythology, entertainment, culture, food, and the list could go on.

The tours across Greece and lectures at the university level were excellent. I felt comfortable participating in the formal and informal discussions. The guides and bus drivers were knowledgeable about all aspects of Greek life and culture. And I feel that my presence enriched the impression that our Greek colleagues had of American mathematicians.

Special thanks to a host of MAA friends who assisted those of us who needed an extra arm. That's what friends are for!

The MAA should organize other similar activities for the membership. Reading a book or surfing the Internet provides information, but walking among the remains of ancient Greece is a once-in-a-lifetime experience!

From Marcia Sward
Executive Director Emeritus,
MAA, Rockville, MD:

When I tell my non-mathematical friends that I went on a "mathematical tour of Greece," they invariably look puzzled, seeing no connection between mathematics and Greece. But mathematicians know immediately about the deep roots that modern mathematics has in ancient Greece and are curious about what we learned. Some of our learning came from lectures by Greek mathematicians and astronomers, some through dialogue with them. One particular special occasion was a visit to the Academy of Athens.

But the deepest insights came from just being in places where ancient Greeks lived and worshiped. A picture may be worth a thousand words, but actually being there is worth a thousand pictures. Although the ancient temples, fortresses, towns, and homes lie in ruins, it is still possible to imagine traveling back in time and seeing them as they must have been so long ago. At the archaeological sites we visited, we were surrounded by the ancient Greeks' records of commerce, their tributes to winning athletes, and the many tales of the lives and loves of the gods and goddesses, all meticulously carved in stone. We were awed by the engineering feats required to construct elaborate temples and fortresses, and most particularly by the immense stone arches, still firmly in place after thousands of years.

Day after day, for fourteen days, we were treated to a bounteous feast of ideas and images. Meal after meal we were also treated to the delights of Greek cuisine. And sharing all this with friends and colleagues made those two weeks even more special. This was definitely a trip to remember. ■

Photographs courtesy of: Julius Barbanel Lisa Kolbe, and Liz Teles.

Mathematics and Art

By Alexander Bogomolny

Who will wish to paint you, when no one wishes to see you? Gotthold Ephraim Lessing *Laocoön*, Everyman's Library, 1970, p. 10

Mathematics and Art was the theme of this year's Mathematics Awareness Month. I believe that the theme selection was unfortunate on several counts. First, we tend to forget that in common language words may have meanings different from their conventional meanings in mathematics. As an example:

Mother: Would you like to have a cookie or ice cream for dessert?

Kiddie: But, Mommy, I want a cookie and ice cream.

Regardless of which connective is used, these two treats are perceived as individual, independent desserts. A similar impression is left by the combination *Mathematics and Art*. For additional examples, let's have a look at past MAM themes. There is never doubt as to what mathematics is not.

Mathematics and Decision Making (1996). Democracy is a human invention. Vote counting and power indices are mathematics. He who loves number counting is bound to be a mathematician. Democracy is one thing. The impossibility to satisfy everyone's political preferences is a proven mathematical truth.

Mathematics and the Internet (1997). First engineers invented the ethernet, then the internet. Computer scientists then came up with the web and eventually a browser. Mathematicians made the internet secure with very, very big prime numbers.

Mathematics and Imaging (1998). Well, getting an image is imaging. Multi-resolution image compression is mathematics. Just think of the abstraction of an expanding hierarchy of vector spaces and their wavelet bases. Incomprehensible abstractions is what mathematicians are good at. But even very abstract mathematical ideas may have practical applications.

Mathematics and Biology (1999). Even without a definition everything is very clear: epidemics is in the domain of biology, epidemics modelling is in the purview of mathematics as is the solution of the resulting equations. This is what mathematicians do after all—solve equations. Biology is biology. Mathematics is something else.

Mathematics and Art (2003). There are plenty of connections. But by juxtaposition or by inductive reasoning, if you will, art is art, whereas mathematics is something else.

I am sure that the message that mathematics is not art was not the intended purpose of the MAM/2003. No, of course not. Mathematics is multifaceted, and its artistic nature is hard to deny. In their well-known book, Kasner and Newman wrote:

> *Mathematics is an activity governed by the same rules imposed upon the symphonies of Beethoven, the paintings of Da Vinci, and the poetry of Homer.*

In the Middle Ages and during the Renaissance, mathematics constituted a major part of the Liberal Arts. This is why math departments usually belong to Liberal Arts colleges. To be sure, mathematics has changed fundamentally since. But it became more of an art, not less.

Therefore I feel apprehensive that the intention of the theme *Mathematics and Art* might have been misconstrued. Indeed, I think it is highly probable that it was. "Sculpture and Art" or "Music and Art" look and sound incongruous, right? Why doesn't "Mathematics and Art"? I would be more comfortable with the caption "Mathematics and the Visual Arts" that was probably the intention to start with. However, I would remain apprehensive even if the latter were selected as the MAM theme.

Why? Because art is an active pursuit of beauty. The concept of beauty, however, and the expressive means of achieving it, differ between various arts. G. E. Lessing, whose *Laocoön: An Essay on the Limits of Painting and Poetry* is considered the origin of modern esthetics, alluded in passing to the difference between painting and sculpture, the most congenial of any two arts:

> *The mere wide opening of the mouth —apart from the fact that the other parts of the face are thereby violently and unpleasantly distorted—is a blot in painting and a fault in sculpture which has the most untoward effect possible.*

The Mandelbrot set is beautiful even if it is the monochromatic blot in the middle of the colorful depiction of equipotential lines. Just to think of the infinite intricacy of the whirl patterns produced by a mere quadratic formula takes one's breath away. Add to that the fact that the set serves as an index into the variety of Julia sets which, in turn, are classified according to the location of a single parameter inside the Mandelbrot set.

Certainly, the now common colorful pictures of the Mandelbrot set have great visual appeal. But then it is so much easier to substitute one for the other: "Ah, this is beautiful; and there's mathematics behind all that! Hence mathematics is beautiful!" I believe such misrepresentations are popular and I deplore the disservice they might be doing to mathematics education. Here's an episode from my personal experience.

The incident occurred several years ago, when my older son took Geometry I in junior high. The boy was given an assignment. The basic idea was to take two line segments and divide them both into an equal number of subintervals. The division points then had to be connected to

form a pretty web of straight lines. It was left to the student's imagination to combine the webs into more intricate patterns. The assignment did not follow, nor was it preceded by, any discussion of mathematical relevance. Division of a line segment into a number of equal parts with straightedge and compass — no. The standard ruler with tick marks was sufficient to complete the assignment. The idea of an envelope of a family of lines had not been mentioned either. The assignment lacked any mathematical content whatsoever. I suggested that he program QuickBasic to automatically generate various patterns. My son insisted that programming was strictly and specifically forbidden. The assignment had to be completed by hand.

After a couple of unsuccessful attempts to engage the teacher, I was granted a meeting with the principal. In the school, the web patterns were proudly decorating all the available wall space. There were lace masterpieces by girls and intricate woodwork by boys—all for the sake of extra credit. The assignment appeared to be a yearly milestone for Geometry I.

The principal readily admitted the shallowness of this exercise. The district math supervisor who was also present remained unmoved. After a short exchange I left utterly disappointed. What a waste of time! And zero knowledge acquisition. As far as I know, the assignment is still being offered as a mathematical attraction.

I am not building a critical edifice based on a single personal experience. There is definitely an unfortunate trend in mathematics education that seeks to endear mathematics to students with no attempt at transferring any significant mathematics. D. Hofstadter asks this question:

> *Why does mathematics today have to be 'relevant' and 'fun', have to prove its worth by chewing gum like a sports star, acting sexy like a movie star, spouting cutesy sound-bytes like a with-it journalist, displaying itself as eye candy like a top model—but, heaven forbid, not by exploring unsuspected symmetries and subtle patterns purely for their own sake, like a scientist (let alone a mathematician!)?*

A common argument leaves me cold. We are often attracted to a book by its cover and may even purchase a book without first tasting a page or two. Yes, we may. But would it not be a disappointment to uncover at home a construction set where we thought to find a book? And what about shoes? Do we buy shoes solely by appearance?

True, it often pays to introduce mathematics gently with story telling or colorful illustrations. The best teachers do that all the time. I could not possibly have an issue with that. So what is it about?

This sound byte, which is the theme *Mathematics and Art*, draws a line between mathematics and art. It pulls the two apart more than it invokes any possible connections. And the fact is that the first impression, however false, is often hard to get rid of. The theme, taken by itself, suggests at best that mathematics has found yet another application, now in art. Big deal! Most artists hate mathematics just like anyone else. Who do we want to cheat? Besides, since the applicability of mathematics is talked about all the year round, would it not make more sense to emphasize its (specifically mathematical) beauty at least once a year, during this special event—Mathematics Awareness Month?

Perhaps it's fitting to relay a story told by Raymond Smullyan in one of his books. A friend invited him for dinner. He told Smullyan that his teenage son was crazy about Smullyan's logic puzzle books and could not wait to meet him. The friend warned Smullyan not to mention that he is a mathematician and that logic is a part of mathematics because the young fellow hated mathematics.

Branko Grünbaum wondered:

> *... it is very likely that Escher **did not** wish to learn any of the mathematics we think might have helped him, and that we are much richer for it.*

No one knows better than mathematicians themselves where the real beauty of mathematics lies. I believe it would enrich both mathematics education and public awareness of mathematical beauty were it pursued regularly and consistently. The other arts could take care of themselves. ■

The first paragraph makes an allusion to D. Schattschneider's note in the March 2003 issue of FOCUS. Other references can be found in Alex's MAA Online April column. This note is in fact a mutilated (but also somewhat improved) version of the latter.

Alex Bogomolny is a former Associate Professor of Mathematics at the University of Iowa. One of the greatest pleasures he enjoys nowadays is watching his 4-and 23-year old sons play together. Alex also spends much time working on his website, Interactive Mathematics Miscellany and Puzzles (http://www.cut-the-knot.org)*, that has been recently recognized with the 2003 Sci/Tech Web Award from the editors of Scientific American.*

IASE 2004 Roundtable

The International Association for Statistics Education (IASE) will hold a "Roundtable" at Lund University in Sweden on June 28 to July 3, 2004. Lund University is close to the ICME-10 location, so this will act as a kind of "satellite conference." The Roundtable will bring together a small number of experts, representing as many different countries as possible, to discuss Curricular Development in Statistics Education. Papers presented and discussed during the conference will be published in a proceedings volume that will present a global overview of Statistics Education. For more information, contact Gail Burrill at burrill@msu.edu or visit http://hobbes.lite.msu.edu/~IASE_2004_Roundtable. ■

Manjul Bhargava Receives Hasse Prize at MathFest

By Joseph Gallian

At the August 2003 MathFest in Boulder Manjul Bhargava received the MAA's Hasse Prize for exposition. It has been quite a year for Manjul. In November 2002 he was the only mathematician among *Popular Science's* "Brilliant 10", the publication's first annual celebration of ten scientists who are shaking up their fields. (The article is available online at http://www.popsci.com/science/article/0,12543,364881,00.html) In January 2003 he was selected to be one of the AMS/MAA one hour invited speakers at the January 2004 Joint Meetings in Phoenix. Then came offers of tenured Associate Professorships from the top Ivy League schools. Shortly thereafter, these offers were increased to full professorships. It is believed that the two years from thesis to full professorship offers is the shortest period ever for an Ivy League school. In June he accepted the professorship from Princeton and also was appointed to the editorial board of the *Journal of Number Theory.*

Manjul Bhargava lecturing on the Fifteen Theorem.

Awards are not new to the 29-year-old Bhargava, who is the son of a chemist father and mathematician mother, Mira Bhargava, a professor at Hofstra University. In high school Manjul was the winner of the First Annual New York State Science Talent Search. As an undergraduate at Harvard he won the Hoopes Prize for his outstanding senior thesis and (three times!) the Derek Bok Award for Excellence in Teaching. He was selected to lead the commencement of the 1600 Harvard graduates of the class of 1996.

Also in 1996 Bhargava received the AMS-MAA-SIAM Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student for work he began at the Duluth REU and expanded on in his senior thesis. A year before he obtained his Ph.D. from Princeton on a Hertz Fellowship, Manjul was also appointed as the first Clay Mathematics Institute Long-Term Prize Fellow and a Visiting Fellow at Princeton University. This past year he was a visiting professor at Harvard.

Manjul's research interests include algebraic number theory, combinatorics, and representation theory. The paper for which he won the Hasse Prize, "The factorial function and generalizations," published in the *American Mathematical Monthly* (November 2000), explains his new generalization of the factorial function and its connections with some classical problems in number theory, ring theory, and combinatorics. His work on the factorial function unifies and generalizes the results of about 20 previous papers, many by well-known mathematicians.

One of Bhargava's recent accomplishments has to do with the so-called "Fifteen Theorem", which was originally proved by Conway and Schneeberger in 1993. It states that if a positive definite quadratic form whose associated symmetric matrix has integer values represents all positive integers up to 15, then it is "universal," that is, it represents all positive integers. Bhargava not only simplified the Conway-Schneeberger proof, but also generalized the result in several beautiful ways. Another of Bhargava's achievements, which was the basis for his thesis, is a generalization of Gauss's 1801 law of composition of binary forms. Manjul showed that Gauss's composition is only one of at least 14 such composition laws.

Andrew Wiles, Manjul's Ph.D. advisor, is quoted in the *Popular Science* article as saying Bhargava's thesis was one of the strongest he's seen in 20 years. Also quoted in the article is Princeton professor Peter Sarnak: "We are watching him very closely. He is going to be a superstar. He's amazingly mature mathematically. He is changing the subject in a fundamental way."

In addition to doing mathematics, Manjul is also an accomplished tabla player, and performs extensively in the New York and Boston areas. He also enjoys nature hiking, running, tennis, and spending time with friends. ■

MAA Writing Prizes Announced at MathFest 2003

Carl B. Allendoerfer Awards

Ezra Brown
"The Many Names of (7, 3, 1)," *Mathematics Magazine,* April 2002, pp. 83-94.

Dan Kalman
"Doubly Recursive Multivariate Automatic Differentiation," *Mathematics Magazine,* June 2002, pp. 187-202.

The Carl B. Allendoerfer Awards, established in 1976, are made to authors of expository articles published in *Mathematics Magazine*. The Awards are named for Carl B. Allendoerfer, a distinguished mathematician at the University of Washington and President of the Mathematical Association of America, 1959-60.

Trevor Evans Awards

Laura Taalman and Eugenie Hunsicker
"Simplicity is not Simple," *Math Horizons*, September, 2002.

Philip D. Straffin, Jr.
"The Instability of Democratic Decisions," *Math Horizons*, April 2002.

The Trevor Evans Awards, established by the Board of Governors in 1992 and first awarded in 1996, are made to authors of expository articles accessible to undergraduates that are published in *Math Horizons*. The Awards are named for Trevor Evans, a distinguished mathematician, teacher, and writer at Emory University.

Lester R. Ford Awards

Leonard Gillman
"Two Classical Surprises Concerning the Axiom of Choice and the Continuum Hypothesis," *The American Mathematical Monthly*, June-July 2002, pp. 544-553.

Warren P. Johnson
"The Curious History of Faà du Bruno's Formula," *The American Mathematical Monthly*, March 2002, pp. 217-234.

Sam Northshield
"Associativity of the Secant Method," *The American Mathematical Monthly*, March 2002, pp. 246-257.

Eleanor Robson
"Words and Pictures: New Light on Plimpton 322," *The American Mathematical Monthly,* February 2002, pp. 105-120.

Sérgio B. Volchan
"What Is a Random Sequence?," *The American Mathematical Monthly*, January 2002, pp. 46-63.

The Lester R. Ford Awards, established in 1964, are made to authors of expository articles published in *The American Mathematical Monthly*. The Awards are named for Lester R. Ford, Sr., a distinguished mathematician, editor of *The American Mathematical Monthly*, 1942-46, and President of the Mathematical Association of America, 1947-48.

Merten M. Hasse Prize

Manjul Bhargava
"The Factorial Function and Generalizations," *The American Mathematical Monthly,* November 2000, pp. 783-799.

In 1986 an anonymous donor gave the Mathematical Association of America funds sufficient to support a prize honoring inspiring and dedicated teachers. The price is named after Merten M. Hasse, who was a former teacher of the donor, and who exemplified the qualities of a fine teacher. The Merten M. Hasse Prize is given for a noteworthy expository paper appearing in an Association publication, at least one of whose authors is a younger mathematician. The prize is designed to be an encouragement to younger mathematicians to take up the challenge of exposition and communication.

George Pólya Awards

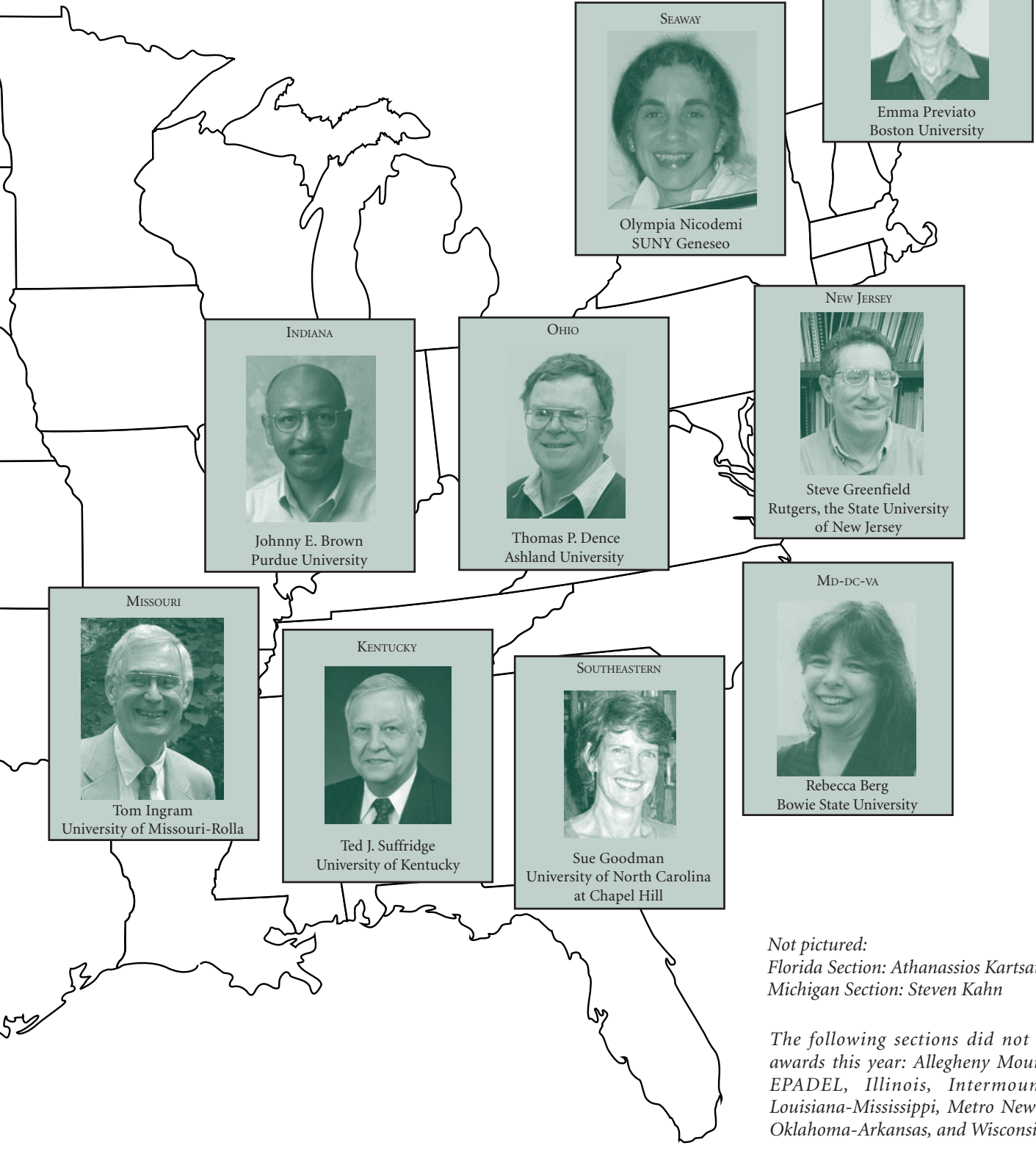
David L. Finn
"Can A Bicycle Create a Unicycle Track?," *College Mathematics Journal*, September 2002, pp. 283-292.

Dan Kalman
"An Undetermined Linear System for GPS," *College Mathematics Journal*, November 2002, pp. 384-390.

The George Pólya Awards, established in 1976, are made to authors of expository articles published in the *College Mathematics Journal.* The Awards are named for George Pólya, a distinguished mathematician, well-known author, and professor at Stanford University. ■

2003 Award Winners for

Distinguished Teaching



Northeastern

Emma Previato
Boston University

Seaway

Olympia Nicodemi
SUNY Geneseo

New Jersey

Steve Greenfield
Rutgers, the State University of New Jersey

Indiana

Johnny E. Brown
Purdue University

Ohio

Thomas P. Dence
Ashland University

Md-dc-va

Rebecca Berg
Bowie State University

Missouri

Tom Ingram
University of Missouri-Rolla

Kentucky

Ted J. Suffridge
University of Kentucky

Southeastern

Sue Goodman
University of North Carolina at Chapel Hill

Not pictured:
Florida Section: Athanassios Kartsatos
Michigan Section: Steven Kahn

The following sections did not make awards this year: Allegheny Mountain, EPADEL, Illinois, Intermountain, Louisiana-Mississippi, Metro New York, Oklahoma-Arkansas, and Wisconsin.

The Mathematical Olympiad Summer Program Brings Together Talented High School Students

By Steven R. Dunbar

In late June and early July, 30 of the best high school mathematics students in the nation grappled with challenging mathematical problem solving at the annual Mathematical Olympiad Summer Program (MOSP) held on the campus of the University of Nebraska-Lincoln in Lincoln, NE. The MOSP is sponsored by the Mathematical Association of America through the American Mathematics Competitions program. This extraordinary group of young mathematicians spent 8 to 9 hours each day in classes and study sessions learning problem solving techniques and solving Olympiad-caliber problems in both team and individual contests. All of the students were top scorers from the 32nd USA Mathematical Olympiad (USAMO) exam in May. Each USAMO participant had already survived two challenging preliminary examinations: the American Mathematics Competition held in February 2003 and the American Invitational Mathematics Exam held in March and April.

Clockwise from lower left seated individual: Jae Min Bae, Tiankai Liu, Boris Alexeev, Daniel Kane, Mark Lipson, Aaron Pixton, Anders Kaseorg, Ron Graham, MAA President, Tony Zhang, Yan Zhang, Zwok Fung Tang, Po-Ling Loh, Po-Ru Loh, and Tina Straley, MAA Executive Director. Photo by Robert A. Strawn.

Among the participants at the MOSP were the top twelve named as the USAMO Winners. They are Boris Alexeev of Cedar Shoals High School in Athens GA, Jae Min Bae of the Academy for Advancement of Science and Technology in Hackensack NJ, Daniel Kane of Madison West High School in Madison WI, Anders Kaseorg of the Charlotte Home Educators Association in Charlotte NC, Mark Lipson of Lexington High School in Lexington MA, Tiankai Liu of Phillips Exeter Academy in Exeter, NH, Po-Ling Loh of James Madison Memorial High School in Madison WI, Po-Ru Loh of James Madison Memorial High School in Madison WI, Aaron Pixton of Vestal Senior High School in Vestal NY, Kwok Fung Tang of Phillips Exeter Academy in Exeter, NH, Tony Zhang of Phillips Exeter Academy in Exeter, NH and Yan Zhang of Thomas Jefferson High School of Science and Technology in Alexandria,VA. The winners were celebrated on June 22-23 with a reception at the MAA Headquarters in Washington D.C., a tour of the National Science Foundation, a reception at the National Academy of Sciences with a talk by Dr. Peter Winkler of Bell Labs (Lucent Technologies), and a gala dinner with the mathematical sciences community in the U.S. Department of State Diplomatic Reception Rooms.

After taking yet another rigorous two-day Team Selection Contest six students were named as the USA team for the 44th International Mathematical Olympiad to be in Tokyo, Japan, on July 11-19. The IMO attracts 500 of the most talented mathematics students from more than 80 countries. The USA team consists of Daniel Kane, Anders Kaseorg, Mark Lipson, Po-Ru Loh, Aaron Pixton, and Yan Zhang. Zuming Feng of Phillips Exeter Academy is the Head Coach and Gregory Galperin of Eastern Illinois University is the Assistant Coach.

MOSP, which covers the subjects which appear on the USA and International Mathematical Olympiads, is deep and sophisticated. It includes number theory, advanced Euclidean geometry, polynomial theory, inequalities, invariants, combinatorics, and counting methods. Students practiced their skills frequently with homework sets and contests which were graded and discussed daily. A typical problem is Problem 2 from the 2003 USAMO: A convex polygon P is dissected into smaller convex polygons by drawing all of its diagonals. The lengths of all sides and all diagonals of the polygon P are rational numbers. Prove that the lengths of all sides of all polygons in the dissection are also rational numbers.

The 12 USAMO Winners, along with their hometowns and schools, the Honorable Mentions, and the questions on the USAMO as well as the answers can all be found at www.unl.edu/amc/. More pictures and information about the American Mathematics Competitions, the USAMO, the IMO and the MOSP are also available on the website. ■

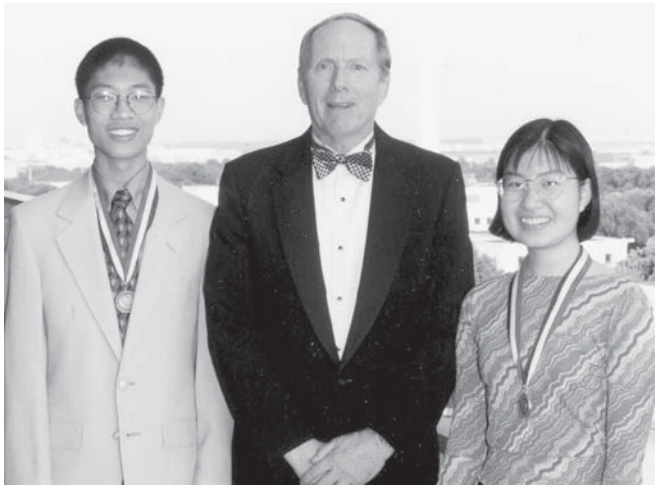
On MOSP, see also the advertisement on page 22 of this issue. Steven R. Dunbar is the Director of the American Mathematics Competitions.

A Problem-Solving Dynasty

By Steve Olson

Tennis stars Venus and Serena Williams may be better known, but the three children of Wei-Yin and Theresa Loh are no less accomplished.

Po-Shen Loh, a senior at the California Institute of Technology, Po-Ru, a Caltech freshman, and their sister Po-Ling, a junior at James Madison Memorial High School in Madison, Wisconsin, are the most decorated set of siblings in the history of U.S. competitive mathematics. All three have scored at the highest levels of national competitions, and the two older boys are the first set of siblings ever to qualify for U.S. International Mathematical Olympiad teams. "Their achievement is unprecedented," says Titu Andreescu, who formerly served as director of the MAA's American Mathematics Competitions and leader of the U.S. IMO team.



Po-Ru Loh, MAA President Ron Graham, and Po-Ling Loh at the USAMO Award Ceremony at the US Department of State.Photo by Robert A. Strawn.

As is the case with many mathematically talented U.S. students, the Lohs learned about competitive mathematics through Mathcounts, the middle school problem-solving program. "In the sixth grade, a teacher called Po-Shen and said that he should take the selection test for the school team," says Wei-Yin, a professor of statistics at the University of Wisconsin. "We had no idea what to expect. We just thought it was a local event."

The following year, Po-Shen did so well at the local and state levels of Mathcounts that he was one of four people selected to the Wisconsin state team. He went to Washington to compete at the national level against 227 other middle schoolers and finished in the top 30. "I was shocked," says Po-Shen, "I thought for sure that I would be in the lower half."

The following year, in eighth grade, Po-Shen placed third in the nation in Mathcounts. According to his father, "That got the attention of his brother, Po-Ru," who was then in the fifth grade. (The Lohs have observed a Chinese tradition of giving their children the same name; one meaning of "po," in Chinese, is "breadth.") "Everybody told Po-Ru he had to do better than his brother, and I thought there was no way he could do that," says Loh, but he was wrong. In the seventh grade, Po-Ru finished second in the nation in Mathcounts, and he finished first in the eighth grade.

"That got the eye of his sister, Po-Ling," says Loh. Two years younger than Po-Ru, Po-Ling was not sure at first that she liked competitive mathematics. "It's traditionally been more of a boys' subject," she says. But in the seventh grade she, too, advanced to the national level in Mathcounts, where she did even better than her eldest brother had done. The following year, in the eighth grade, she was second in the nation. No other girl has ever done as well in the national Mathcounts competition.

When Po-Shen began high school, "we thought that was the end of the competitions," says Wei-Yin. But then the Lohs discovered the American Mathematics Competitions (AMC) examinations sponsored by the MAA. Beginning his freshman year, Po-Shen took the American High School Mathematics Examination (which has since been split into the AMC 10 and AMC 12). In his junior year he did so well that he qualified first for the American Invitational Mathematics Examination and then for the United States of America Mathematical Olympiad (USAMO). He finished among the top 12 in the nation on the USAMO, earning a trip to Washington, D.C., to be honored at a black tie dinner at the State Department. And he qualified for the U.S. International Mathematical Olympiad team that year, where as one of six team members he earned a bronze medal at the 1999 Olympiad in Romania.

The next year Po-Shen and Po-Ru, then a freshman, finished among the top 12 on the USAMO — the first time two siblings ever had achieved that feat. Po-Shen opted to do a fellowship at Caltech that summer, but Po-Ru was on the Olympiad team that went to Korea in 2000, where he earned a silver medal. Po-Ru also was on the Olympiad teams that competed in Scotland in 2002 and Japan in 2003, earning gold medals both times. And in 2003, the second set of siblings ever to finish together in the top 12 on the USAMO came to the State Department dinner in Washington, when Po-Ru was joined by his sister Po-Ling.

With such accomplished children, Wei-Yin and Theresa Loh often are asked for their secret. But they say that the credit belongs entirely to their children. "We haven't done anything special with them," says Wei-Yin. "They got each other interested in it." ■

Steve Olson is the author of "Mapping Human History: Genes, Race, and Our Common Origins" and the forthcoming "Brainstorms: Six Kids Vie for Glory at the World's Toughest Math Competition."

NSF Beat September 2003

By Sharon Cutler Ross

The NSF has announced a new program to complement the VIGRE (Vertical Integration of Research and Education) initiative that is already underway. VIGRE will become part of a three-pronged effort to increase the number of U.S. citizens, nationals, and permanent residents who are well prepared and pursue careers in the mathematical sciences. The new program, Enhancing the Mathematical Sciences in the 21st Century (EMSW21), is comprised of VIGRE, Research Training Groups in the Mathematical Sciences (RTG), and Mentoring through Critical Transition Points in the Mathematical Sciences (MCTP). A broad stroke description of each component follows. A complete description may be found at the NSF website. All three components have the same proposal deadline: 16 September 2003.

VIGRE

VIGRE projects must be designed to promote interaction among undergraduates, graduate students, postdoctoral associates, and faculty members in a department (or departments). A team approach based on broad support by faculty should integrate research and education for graduate students and involve undergraduates in learning by discovery. A new feature of the revised VIGRE program is the possibility of support for international research and education activities. All VIGRE proposals are required to include an extensive curriculum review supported by five years of data.

Goals for graduate students in a VIGRE project include significant teaching experience, involvement with research activities involving the full range of participants, broad and deep graduate education, and the development of strong communication skills. In contrast to traditional graduate support, VIGRE participants should have significant time for course work, research, and other activities as well as at least one year of supervised teaching.

Undergraduates in a VIGRE project will gain research experience through activities such as faculty-directed projects, internships, or participation in interdisciplinary research. Mentoring of these students should aim to stimulate further interest in the mathematical sciences and to develop enhanced mathematical communication skills.

A VIGRE project is intended to offer postdoctoral associates opportunities outside the usual mathematical sciences education and training through interdisciplinary research experiences, external internships, and participation in research institute programs. A critical element is mentoring as it is for the undergraduate and graduate students. For the postdoctoral associates, mentors should help develop successful researchers, communicators, and mentors.

The NSF anticipates making up to seven VIGRE awards based on a budget of $10,000,000. Grants will be $400,000 to $1,000,000 per year for three years with the possibility of an extension for two more years. A VIGRE proposal should describe a five-year plan.

RTG

A Research Training Group will be a group of researchers focused on a major research theme. Members may come from different departments or institutions, but the research and education activities must be based in the mathematical sciences and in a mathematical sciences department. Support requests for advanced undergraduates, graduate students, postdoctoral investigators, and visitors may be included in a RTG proposal. A significant collective mentoring component is required to help ensure that all participants benefit from new or enhanced research-based training and education. Funding of $4,000,000 will support up to nine RTG awards. A program may receive up to $500,000 per year for one to five years.

MCTP

The Mentoring through Critical Transition Points program solicits proposals that deal with any of the following or similar career transitions: from undergraduate to graduate school; from course work to original research; from graduate school to a postdoctoral appointment, to a teaching position at an undergraduate institution, or to a position in industry. Proposers should describe plans for addressing the issues related to a specific transition point or set of points, for the recruitment of participants with particular attention to those from underrepresented groups, and for careful mentoring of the participants. The NSF hopes to make awards of up to $500,000 per year for one to five years to fund six MCTP projects. ■

NSF to Fund "Science of Learning" Centers

The National Science Foundation plans to fund several Science of Learning Centers that focus on studying how people learn and transform the knowledge into practical ways of improving teaching. The Centers are to be interdisciplinary and are expected to develop "appropriate partnerships with academia, industry, all levels of education, and other public and private entities." For more information, see http://www.nsf.gov/home/crssprgm/slc/summary.htm. ■

MAA Election Results Are In: Carl Cowen Will Become the Association's 51st President

Carl C. Cowen of Purdue University will be the MAA's next President. He will serve as President-Elect in 2004 and begin a two-year term as President in January 2005, when he will succeed Ronald Graham. That year will also mark the MAA's 90th anniversary.

Carl C. Cowen

Barbara T. Faires of Westminster College (New Wilmington, PA) was elected the Association's next First Vice-President for the term 2004-2005.

And for the position of Second Vice-President, Jean Bee Chan of Sonoma State University (Rohnert Park, CA) won the two-year term 2004-2005.

Professor Cowen is at present the MAA's First Vice-President. He is former Head of the Mathematics Department of Purdue University, and is coauthor of *Composition Operators on Spaces of Analytic Functions* (1995).

He won the Haimo Award for Distinguished Teaching in l997 and has over the past decade served the Association as a representative and consultant to numerous committees, councils, and boards, and been a member of the Joint Advisory Board for FOCUS and MAA Online.

"I will work within the MAA and with other organizations to connect our students with the phenomenal opportunities in the mathematical sciences," he said, "and to build better mathematical futures for us all."

Barbara T. Faires, a 2002 Allegheny Mountain Section Teaching Award winner, is a long-standing member of the MAA who has served as Chair of the Committee on Sections and on a host of committees, including Audit and Budget, Finance, Executive, Strategic Planning, Gung Hu Award, and others. She is currently the Chair of the Coordinating Council on Awards.

Barbara T. Faires

One important goal of the MAA "is to expand membership to include a larger percentage of those interested in undergraduate mathematics education," said Professor Faires. "I will work to ensure continued success of Project NExT and other such projects from which future leaders will come."

Jean Bee Chan served on the MAA Board of Governors (l999-2002) and as Vice-Chair of the Northern California Section (l996-97). She has also served on the Association's Membership Committee, Development Committee, and Committee on Undergraduate Student Activities and Chapters.

Jean Bee Chan

Prof. Chan stated "I will devote my energy to increase public appreciation of mathematics, work for student programs, and generate financial support for the MAA." ■

Former FOCUS Editor Keith Devlin Wins Italian Literature Prize

MAA Online columnist Keith Devlin has been awarded the Italian Peano Prize for 2002. The prize is awarded to the author of a book of "readable mathematics" published in Italian during the year of attribution, and is the only award in Italy dedicated to this subject. Devlin was chosen to receive the award for his books *The Math Gene* and *The Language of Mathematics,* both of which have been reviewed in the *Read This!* section of MAA Online.

Keith Devlin

Previous winners are Apostolos Doxiadis of Greece and Alaine Connes of France. Other authors whose books were considered for the 2002 prize included Amir Aczel, Freeman Dyson, Michele Emmer, Stephen Hawking, Roger Penrose, Charles Seife, and Ian Stewart.

Devlin will travel to Turin in the fall to be awarded the prize and to give an invited public lecture. ■

Distance Learning Program Sought

Community College mathematics professor is seeking a doctoral program in mathematics that would offer some courses via distance learning. His plans are to complete the degree (on location) during a two/three year leave of absence from full time employment.

Contact Information:

S. Kaczkowski
S.U.N.Y. Orange
115 South Street
Middletown, NY 10940
Email: skaczkow@sunyorange.edu

Short Takes

Compiled by Fernando Q. Gouvêa

MAA Online on the Radio

We understand that Michael Krazny, in a program called *Forum* that can be heard on KQED (the NPR station in the San Francisco area) recently recommended that viewers visit MAA Online's *Read This!* section. He also recommended John dePillis's book, *777 Mathematical Conversation Starters*. We are, of course, in full agreement with both of Krazny's recommendations.

This Just In

Patricia A. McKillip's new book, *In the Forests of Serre*, was recently offered by the Science Fiction Book Club with the blurb "Whoever walks the forests of Serre may never find his way home." We are reliably informed, however, that the book is not about being lost in the mathematical work of the recent Abel laureate. His many papers, after all, are more like mountaintops than they are like forests.

Commemorations

This year marks the 400th anniversary of the death of French mathematician François Viète (1540-1603), who made contributions to algebra and other branches of mathematics. It is also the centenary of the birth of Andrei Nikolaevich Kolmogorov, famous among other things for proposing a mathematical foundation for the theory of probability. Both anniversaries will be marked by conferences and other special events. Also worthy of note is the 25th anniversary of TEX, celebrated this July at the TUG (TEX Users Group) meeting in Hawaii.

AMS Centennial Fellowships

The AMS announced that it has awarded Centennial Fellowships to two outstanding research mathematicians: Henry H. Kim of the University of Toronto, who works on the theory of automorphic forms and L-functions, and John E. Meier of Lafayette College, who works on geometric group theory. Meier, who is a member of the Association, is one of the few Centennial Fellows to work at a small college.

Kaplan Plans Move Into Teacher Education

Kaplan Inc. is the latest institution to open a school of education, hiring Harold O. Levy, the former New York City schools chancellor, to run its school, which will target working adults who want to switch careers. When he was chancellor in New York, Levy developed a Teaching Fellows program that catered to those who sought to change careers. Levy envisions "a full-service school of education" that would award associate, bachelor's and master's degrees. Kaplan will seek accreditation for the school from the North Central Association of Colleges and Schools.

National Research Council Suggests States Fund Educational Research

A report by the National Research Council calls upon states to band together and invest in educational research. The NRC report proposes the creation of a "strategic education research partnership" that would bring together scientists and partnerships to conduct research in school and district settings. The report, "Strategic Education Research Partnership," can be viewed online at http://books.nap.edu/books/0309088798/html/index.html.

RAND Report Released

The RAND Corporation has released a report entitled *Mathematical Proficiency for All Students.* Prepared by a panel of mathematicians and mathematics educators chaired by Deborah L. Ball, the report concludes that the many attempts to create the conditions for all students to attain a reasonable level of mathematical proficiency suffer from an inadequate empirical research base. It, therefore, proposes a wide-ranging research program in mathematics education aimed at figuring out what actually will help attain the goal of proficiency for all. The report can be ordered in book form or viewed online at http://www.rand.org/publications/MR/MR1643/.

MAA Member George Andrews Elected to National Academy of Sciences

The National Academy of Sciences announced the election of 72 new members and 18 foreign associates from 11 countries in recognition of their distinguished and continuing achievements in original research. Six of the new members are mathematicians, statisticians, or computer scientists and one—George Andrews —is also a member of the MAA. Election to membership in the Academy is considered one of the highest honors that can be accorded a scientist or engineer.

The new members in the mathematical sciences are: George E. Andrews of Pennsylvania State University, James O. Berger of Duke University, Yakov Eliashberg of Stanford University, Solomon W. Golomb of the University of Southern California, Karl Hess of the University of Illinois, and Haim Brezis of the Universitè Pierre et Marie Curie, elected as a foreign associate. ■

Sources. Krazny: Jerry Alexanderson, Frank Farris. *Forests of Serre*: SFBC flyer. Commemorations: email communications, http://tug.org. Centennial Fellowships: email communication, *Chronicle of Higher Education*, AMS website. Kaplan: *Chronicle of Higher Education*, http://www.kaplan.com/about/f1b.html. NRC: *Education Week*, 09 April 2003, National Academy of Sciences website. RAND report: *Education Week*, 30 April 2003, RAND website. New NAS members: NAS website.

American Institute of Mathematics Research Conference Center Call for Proposals

Proposals are now being solicited by the American Institute of Mathematics (AIM) Research Conference Center (ARCC), for small, focused workshops to be held between summer 2004 and summer 2005. These workshops are sponsored by AIM and the National Science Foundation, which jointly fund ARCC. It is anticipated that there will be eighteen focused workshops in 2004-2005, at AIM in Palo Alto, California. Each workshop will last approximately one week and involve up to 32 participants, allowing for close collaboration between scholars. All participants receive full funding to attend.

Whereas fifty years ago mathematical collaboration was relatively rare, today approximately half of all mathematical papers are written by multiple authors. ARCC helps to develop and support such collaborations by holding small, focused research workshops that allow entire groups of attendees to devote their efforts toward accomplishing a specific mathematical goal. Special attention is paid to facilitating collaborations that include women, underrepresented minorities, and researchers at primarily undergraduate institutions. To aid in collaboration before and after the workshops, each workshop has an accessible website which includes open problems and progress updates.

Proposals will be accepted until November 1, 2003. Typically one to two pages in length, proposals should describe the specific mathematical goal comprising the focus of the workshop. Also included should be an outline of how this goal would be accomplished during the week, as well as anticipated workshop outcomes. Proposals will be judged for their scientific merit and timeliness, as well upon their appropriateness for a small, intensive workshop format. The overall quality of the workshop plan and the likelihood that the proposed goals would be achieved are also considered. A list of expected participants is required as part of the proposal. The inclusion of women, members of underrepresented ethnic/racial groups, junior researchers, and researchers from primarily undergraduate institutions is a plus.

AIM is a nonprofit mathematics institute based in Palo Alto, California, and has been in existence since 1994. AIM was founded by Silicon Valley businessmen John Fry and Steve Sorenson, to support research mathematics. John Fry received an undergraduate degree in mathematics at Santa Clara University, and was inspired by his professor and former MAA president, Gerald Alexanderson, who is chair of the board of trustees of AIM. AIM also sponsors conferences, small focused research groups, REUs, public math lectures, and math activities for local high school students.

See http://www.aimath.org/ARCC/ for more information. ■

Final Report on Project to Assist Mathematics Departments to Monitor Their Undergraduate Programs

An NSF-funded project to develop statistical indicators to help college mathematics departments to monitor the quality of their lower division (first two years) undergraduate mathematics programs was announced in a prior issue of FOCUS (August/September, 2001). The project, carried out under the direction of a national advisory panel, collected data from the mathematics departments on three campuses: a community college; a comprehensive state university, and a research university. A final report summarizing the major findings is now available online or on CD at the website, http://www.mste.uiuc.edu.

The final report also provides background for the project. *Student outcomes and assessment*, by John A. Dossey and Alan H. Schoenfeld, is a comprehensive paper, that outlines strategies, together with abundant sample assessment items, for monitoring student achievement in mathematics. Also included is a collection of abstracts of over 100 research articles on teaching and learning undergraduate mathematics. The documents are provided in a database that is searchable by topic, statistical indicator, author, and title. For further information contact Kenneth J. Travers at ktravers@uiuc.edu. ■

The Tenth International Congress on Mathematical Education (ICME-10)

Under the auspices of ICMI (International Commission on Mathematical Instruction) the 10th International Congress on Mathematical Education, ICME-10, will be held in Copenhagen, Denmark, July 4-11, 2004. The aim of the ICME congresses is to:

- Show what is happening in mathematics education worldwide, in terms of research as well as teaching practices
- Exchange information on the problems of mathematics education around the world
- Learn and benefit from recent advances in mathematics as a discipline

ICME-10 hopes to attract between three and four thousand researchers in mathematics education, mathematics educators, including teachers, and others working within the educational system, from around 100 countries. Applications to attend can be found at the ICME-10 website at http://www.icme-10.dk. Travel grants are available through NCTM. For more information and grant applications, visit the NCTM website at http://www.nctm.org/icme10/. ■

Data on Gender For 2002

Below is the information collected for the year 2002.

MAA Awards

Total Awards	22
Female Awardees	3
Male Awardees	19

Percentage of Female Participation: 14%

Board of Governors

Total Board Members	51
Female Board Members	17
Male Board Members	34

Percentage of Female Board Members: 33%

Nominees to the Board of Governors

This list includes nominees for section governors elected in 2002 as well as nominees for other governor slots included in Board agendas.

Total Nominees	26
Female Nominees	5
Male Nominees	21

Percentage of Female Nominees: 19%

Committee Chairs

This list includes chairs of committees, including joint committees, representatives, and editors.

Total Chairs	96
Female Chairs	31
Male Chairs	65

Percentage of Female Chairs: 32%

Speakers at National Meetings

This list includes MAA Invited Addresses, Minicourses and Short Course Instructors, and Organizers of Contributed Paper Sessions.

Total Speakers	110
Female Speakers	44
Male Speakers	66

Percentage of Female Participation: 40%

MAA American Mathematics Competitions Program Seeks MOSP-IMO Leader

The MAA seeks a mathematician to be Academic Director of the Mathematical Olympiad Summer Program June-July, 2004 in Lincoln, NE and Leader of the US delegation to the International Mathematical Olympiad in Athens, Greece July 6-18, 2004. Must be excellent mathematical problem solver, have excellent teaching skills and be able to work with exceptionally talented high schools students, and be able to represent the USA and the MAA. Experience with AMC and Olympiad style math competitions is desired. The position is renewable for succeeding summer programs in 2005 and 2006. Please send letter of application and resume by November 1, 2003, to Prof. Steve Dunbar, MAA American Mathematics Competitions, 1740 Vine Street, Lincoln, NE. Please direct your inquiries about the position to Professor Dunbar at 1-402-472-6206 or sdunbar@math.unl.edu.

Have You Moved?

The MAA makes it easy to change your address. Please inform the MAA Service Center about your change of address by using the electronic combined membership list at MAA Online (www.maa.org) or call (800) 331-1622, fax (301) 206-9789, email: maaservice@maa.org, or mail to the MAA, PO Box 90973, Washington, DC 20090.

Career Brochure Order Form

The new MAA career brochure *We Do Math!* highlights eleven profiles from *101 Careers in Mathematics*. These vignettes describe a variety of non-academic careers for which a background in the mathematical sciences is useful. Each of the jobs presented shows real people in real jobs.

The eight-panel brochure is 4" by 9" (folded) and can be mailed in a standard envelope or distributed in the classroom or at career fairs or recruiting events.

When students want to know how a mathematics degree can benefit them, be prepared to answer with *We Do Math!*

A Special Offer

Your school logo and/or contact information can be printed on the brochure

Schools ordering brochures in time have the option of including the school logo and/or contact information on the front of the brochure. PRE-ORDERS + LOGO (black or one-color version only) **must be received by MAA headquarters by September 12, 2003.**

Brochure Pricing

Copies of *We Do Math!* are available in bulk in multiples of 1000. If you add your institutional information on the brochure, there is a one-time set up fee of $150.00.

Quantity:_____ at $175/1000 = _____

Setup: $150.00

Total: _____

☐ **Yes!** I want to preorder brochures with my school logo and/or contact information on the brochure.

☐ I want to order brochures without my school logo on the front.

Questions?

Contact Chris Proesel
(202) 319-8469
cproesel@maa.org

We're looking for more career profiles. If you would like to contribute profiles featuring your students for possible use in future brochures, please contact us.

Contact Name	
School	
Phone Number	
Fax Number	
Email	

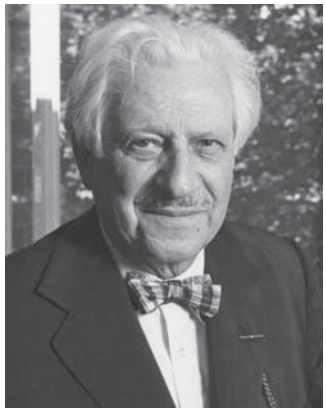
I. Bernard Cohen (1914–2003)

By Judith V. Grabiner

I. Bernard Cohen, the thesis director for many of the first generation of professionally trained American historians of mathematics and the first American to receive a Ph.D. in the History of Science in the United States, died at his home in Waltham, Massachusetts on June 20. Best known to the mathematical community as America's most prominent Newtonian scholar, Cohen was the author of many books, including his monumental critical edition (1972) and the definitive modern translation (1999, with Latinist Anne Whitman) of Newton's *Principia.* Also notable are *The Newtonian Revolution* (1980), analyzing Newton's mathematical physics, and *Newton: Text, Background, Commentaries* (1995), a comprehensive collection of primary sources and recent scholarship, co-edited with Richard S. Westfall.

Educated at Harvard, Cohen received his B.S. in Mathematics in 1937, and his Ph.D. in the History of Science in 1947. He taught history of science at Harvard from 1946 until 1984, and later taught at Brandeis and at Boston College. Although the history of mathematics was not Cohen's primary field, his knowledge of it was amazing, and it was he who introduced many future historians of mathematics to topics as diverse as algebra in Islamic civilization, the statistical revolution of the nineteenth century, and Kepler's anticipations of the integral calculus. Among his Ph.D. students at Harvard were the historians of mathematics Uta Merzbach, Victor Hilts, Bruce Collier, Joseph Dauben, Kenneth Manning, Lorraine Daston, Joan Livingston Richards, and the present writer. Other notable historians of mathematics, including Wilbur Knorr, took Cohen's courses while at Harvard.

Cohen was a wonderful mentor. He and his wife often had graduate students over to their home, bringing students together with visiting scholars. He made it seem as though this was the natural way to treat graduate students. He always worked to help young—and older—



I. Bernard Cohen

scholars, whoever and wherever they might be, independently of their conventional academic stature. Without fanfare or ideology, he was a champion of equal treatment for women at a time when it was far from universal at Harvard.

He taught his students, many of whom were trained in the sciences, how to think like historians. One of his maxims was "Remember that scientists of the past were just as intelligent as we are, so that, if we had lived when they did, what puzzled them would puzzle us too." Another maxim, a call to ethical scholarship and the excitement of research, was "Truth is more interesting than fiction." Above all, Cohen had an unerring ability to pick out what was important and to discourage what was lazy, superficial, or trivial—and to do this in a way that empowered, rather than discouraged. He was always delighted when somebody could teach him something new. "That's very interesting!" was one of his characteristic responses. He understood the exigencies of academic life thoroughly and got them across to his students. I am fond of quoting what he said when I was trying to finish my dissertation by the deadline: "Don't get it perfect; get it done."

Generations of Harvard students were introduced to the physical sciences through Cohen's general-education courses. His lectures were intellectually and physically dramatic: The model train exhibiting the inertial motion of projectiles and the stroboscopic photographs of parabolic motion remained in students' minds many years later. I have a vivid memory of Cohen demonstrating Copernicus's three motions of the earth by walking around a table and twirling a well-aimed yardstick.

Arising from his courses was his wonderful little book, historically sophisticated but also highly readable, *The Birth of a New Physics* (1960, updated 1985), which clearly and succinctly describes the history of physics and astronomy from Aristotle through Copernicus, Tycho, Galileo, and Kepler, culminating in the achievements of Newton. Yet another of his books, *Revolution in Science* (1985), covering developments from Renaissance astronomy and anatomy to Einstein and Continental Drift, won the 1986 Pfizer award of the History of Science Society. His interest in the history of computers resulted in another book, *Howard Aiken: Portrait of a Computing Pioneer* (1999). Among his many articles on subjects of interest to mathematicians, I would especially highlight three in the *Scientific American*: on Florence Nightingale as a statistician, on Newton's discovery of gravity, and an interview with Albert Einstein shortly before the latter's death. The manuscript of Cohen's last book, *The Triumph of Numbers*, a history of numbers and their impact on society and culture, was mailed to the publisher one week before he died.

Cohen leaves his wife of nineteen years, Susan Johnson, a daughter, Dr. Frances Cohen, and granddaughter Angelica Koch of New York, and two stepsons, David Johnson of St. Louis and Benjamin Johnson of New York. A memorial service is being planned for November 19, 2003; see http://www.fas.harvard.edu/~hsdept/ for information. His many graduate students, colleagues, and friends will miss him beyond what words can convey. ■

Etta Zuber Falconer (1933-2002)

By Sylvia T. Bozeman

Etta Z. Falconer passed away on September 19, 2002. She had retired in May 2002 as Fuller E. Callaway Professor of Mathematics at Spelman College where she spent 37 years on the faculty. Falconer was a transforming force at the College while holding positions as Chair of the Mathematics Department, Chair of the Division of Natural Sciences and Mathematics, Associate Provost for Science Programs and Policy, Senior Advisor to the President and Acting Provost. In these and her many roles beyond Spelman College, she committed herself to excellence and left a rich legacy that forever places her at the national forefront in efforts to increase the presence of minorities and women in mathematics and science.

Etta was one of two daughters born to Walter A. Zuber and Zadie L. Montgomery in Tupelo, Mississippi. At age 15, she entered Fisk University where she earned the B.A. degree in mathematics in 1953. A year later she would earn the M.S. degree in mathematics from the University of Wisconsin and begin a teaching career at Okolona Junior College (MS). She returned to graduate school at Emory University where she earned the Ph.D. degree in 1969 with a dissertation entitled *Quasigroup Identities Invariant Under Isotopy*, written under advisor Trevor Evans. Prior to that time, there were fewer than 15 African-American women in the U.S. who had earned the doctorate in mathematics.

Falconer's research in algebra and subsequent publications were highly regarded, yet she chose to devote her exceptional creativity to the design of highly effective academic structures that would increase access to education in science and mathematics for generations of black women. It was her greater vision to increase the diversity of the U.S. scientific community. Under Falconer's leadership, the College added majors and departments in Computer Science and Physics and a concentration in Environmental Science, and worked with the National Aeronautics and Space Administration to launch the Women in Science and Engineering Program, an initiative that has contributed scores of extremely talented women to the scientific community over the past decade. In addition, she was an inspiring mentor for hundreds of students, faculty and staff, including this writer.

Several honors and awards indicate the extent of Etta's impact, the breadth of her service and the depth of her commitment to the advancement of students in mathematics and science. Recognitions include the Giants in Science Award from the Quality Education for Minorities Network; an honorary doctorate degree from the University of Wisconsin at Madison; a Lifetime Mentor Award from the American Association for the Advancement of Science; a Distinguished Service Award and a Lifetime Achievement Award from the National Association of Mathematicians; and the Louise Hay Award for Contributions to Mathematics Education from the Association for Women in Mathematics. In April 2002, Spelman College gave recognition to the magnitude and importance of Etta's contributions when it opened a state-of-the-art science center that bears the Falconer name.

Etta Z. Falconer

Falconer's impact on the development of minorities in science is profoundly reflected in her own family. She, with her loving husband Dolan, nurtured the development of their children: Dolan, Jr., a nuclear engineer; Alice, a pediatrician; and Walter, an urologist. Following in Etta's footsteps is granddaughter, Shelby, a sophomore at Spelman College.

We will miss Etta Falconer—miss her wise counsel, her warm and gentle spirit, and her strong voice of advocacy in the scientific community. ■

Sylvia T. Bozeman is Professor of Mathematics at Spelman College.

PREP Workshop–Integrating Technology into Math Instruction

On May 26-30, 2003 a culturally diverse group of mathematics professors participated in an MAA PREP Workshop entitled "Integrating Technology into Mathematics Instruction." The focus was on the use of technology in precalculus and calculus classes. Prof. Jacqueline Brannon Giles was the program director and Professors Wade Ellis, Queen Hamilton, and William Hawkins were workshop presenters. HCC Central College's Academic Dean, Dr. Cheryl Peters served as an administrative consultant to assure that the interface between the workshop activities and the HCC system was smooth. The workshop was funded by the National Science Foundation and administered by the Mathematical Association of America.

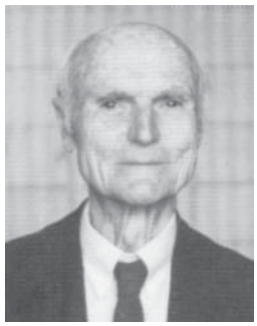
H.S.M. Coxeter (1907-2003)

Harold Scott McDonald Coxeter, noted geometer and author of many books, passed away on March 31 at the age of 96. Known as Donald to family and friends, Coxeter was educated at the University of Cambridge and came to the University of Toronto in 1936. There, he was active as both teacher and researcher until his death.

Coxeter made important contributions to geometry and related areas, focusing especially on group theory and discrete groups, graph theory, projective geometry, the theory of polytopes, and non-Euclidean geometries. As happens to many creative and influential mathematicians, Coxeter's name has been attached to several mathematical objects, including Coxeter groups and the Coxeter graph. He wrote more than 200 mathematical papers on many different subjects.

But while Coxeter's research was important and creative, his talents as an expositor may have been even greater. His expository books are classics to which those who love the subject find themselves returning over and over. Two of those books were published by the MAA: *Non-Euclidean Geometry* and *Geometry Revisited* (the latter co-authored with S. L. Greitzer). His most famous book is probably *Introduction to Geometry*, written in 1969 and still in print from Wiley.

In addition to mathematics, Coxeter cherished music and the arts, and was particularly interested in connections between mathematics and the arts. He was intimately involved in studying M. C. Escher's work. Coxeter was a Fellow of the Royal Society of Canada (1947), Fellow of the Royal Society, London (1950), and Companion of the Order of Canada (1997). He also received several honorary degrees.



H.S.M. Coxeter

Coxeter is survived by his daughter Susan Thomas and his son Edgar. He will be missed by all of the mathematics community. ■

In Memoriam

Barbara Beechler died on March 18, 2003. She was an active member of the Association and served as a governor of the Southern California section. She was an MAA member for 53 years.

James Crawford died on May 8. He had been an MAA member for 42 years and was honored with an MAA teaching award by the EPADEL Section in 1998.

Robert James, co-author of one of the first dictionaries of mathematics, first published in 1942. He was an MAA member for 51 years.

Geraldine D. Smith, editor and author of many mathematics textbooks, was 100 years old when she died in June. She was an MAA member for 49 years.

FOCUS will print short death notices of MAA members. Please send names, dates, and one or two biographical sentences to the editor at fqgouvea@colby.edu.

Letter to the Editor

I am writing to comment on the article, "The Four As: Accountability, Accreditation, Assessment, and Articulation" by Peter Ewell and Lynn Arthur Steen, which appeared in the May/June, 2003, issue of FOCUS.

In evaluating the issues raised in this article it is of fundamental importance for your readers to be aware of some controversial aspects of the "No Child Left Behind" legislation (NCLB) that were not fully explicated by your writers. I became aware of these aspects only through my work as a member of a local board of education, and I suspect that relatively few of your readers are familiar with them.

Earlier this month I attended a meeting organized by a senior member of congress that was attended by several dozen local school officials and a handful of state legislators as well as some high-ranking state education officials. The discussion made it clear that many within the K-12 community see NCLB not as a legitimate effort to improve the quality of education but rather as part of a systematic effort to undermine support for public education in this country.

It is tempting to dismiss this concern as paranoia. To be sure, people in public education are prone to be suspicious of an administration whose secretary of education has publicly declared that he considers parochial schools superior to public schools.

Nevertheless, the educators raise some telling points. For example, results (the proportion and number of 'failing' schools and districts, based ultimately on the raw scores of individual students on various exams) are to be reported uniformly nationwide, even though the level of rigor on the actual exams varies widely from one state to the next. Another example is the shortage of new funding for this major initiative that will require significant resources. Whether or not one embraces the suspicions, the concerns cannot be dismissed out of hand. Motives aside, it is important to think carefully about consequences. This was just underscored by recent news reports that states such as Texas are now scrambling to weaken their standards in order to cope with the provisions of NCLB.

From this perspective, the remark that "[m]any feel that higher education's turn is next" is rather ominous. The mathematics community needs to pay close attention.

Daniel Frohardt
Wayne State University

The authors reply:

This remark was intended to be ominous. Professor Frohardt's concerns are well founded, as is his urging that the mathematics community become better acquainted with the implications of NCLB.

What's the Best Textbook?—Elementary Number Theory

By Fernando Q. Gouvêa

The "best textbook" is, of course, not a well-defined concept. The phrase immediately brings questions to mind: Best for what purpose? Who is the professor? Who are the students?

At Colby, the introductory number theory course is offered in alternate years and attracts a wide range of students. Because it has few pre-requisites, prospective mathematics majors can take it in order to find out what this math thing is all about. The class usually includes several such students, plus mathematics majors and a few computer science majors. Some students are very experienced at reading and writing proofs, others are very much beginners at this game.

My goals for the course reflect this varied audience. I want to give students a taste of the fascination of the subject, to have them realize how easy it is to spot number-theoretical patterns and how difficult it is to predict whether the patterns, once found, will be easy or hard to prove. I emphasize numerical experimentation, but I also emphasize the importance of finding proofs.

What kind of textbook is helpful for such a course? There are actually many choices. One could choose a text that is useful as a reference, a place for students to look for formal proofs of statements handled informally in class. I have made this choice in courses for more advanced students, but for this course I feel such a book would be too hard to handle. Most of my students don't have enough experience of the typical terseness of formal mathematics books.

A second possibility would be to choose a textbook that emphasizes the computational side of the course, using the computer either to create an interactive classroom or as a source for interesting problems. For an interactive and exploratory course, I would probably choose *Discovering Number Theory*, by Jeff Holt and John Jones (Freeman, 2001), which was reviewed in MAA Online (see http://www.maa.org/reviews/dnt.html). A more advanced course with a computational emphasis could be based on *A Course in Computational Number Theory*, by David Bressoud and Stan Wagon (Key College Publishing, 2000), also reviewed in MAA Online (http://www.maa.org/reviews/bresswagon.html).

In the end, though, I prefer a more traditional teaching style, and I don't really want to make my course too dependent on the computer. Many of the students who take the course would be happy to use a program like *Mathematica*, but many others have little experience with computers and would prefer not to have to deal with such a large and complicated computer program. I do encourage them to use computational aids (at least a calculator, but preferably something that can do infinite-precision integer arithmetic, such as a TI-89 or the GP-PARI program). I try to leave enough room for personal choice and variation.

Two other important factors need to be considered. The first is whether one is going to expect students to *read* their textbook. I usually want them to do that, and I hope they will get something out of their reading. That puts severe constraints on the choice of textbook. A few of my personal favorites, such as H. Davenport's *The Higher Arithmetic* and Daniel E. Flath's *Introduction to Number Theory*, turn out not to work very well with students. Davenport, for example, is a penetrating and readable book, but he rarely delimits his proofs and theorems in a formal way. For students who are just starting out, this makes the book very difficult to read and understand: it is already hard enough for them to understand proofs; asking them to figure out where the proof starts and ends without clear textual markers is asking too much.

The second crucial factor is whether the book is "open" or "closed." What I mean is this: Does the book hint at the glories and mysteries of number theory, or does it simply try to do a good job of presenting the subject without pointing to further questions? I can see arguments for both approaches. A "closed" book can give students a satisfying feeling of having mastered something, for example. But I have always preferred an "open" style that constantly hints at deeper questions. In number theory, this is particularly crucial in the treatment of quadratic reciprocity, perhaps the biggest theorem in the elementary course. The quadratic reciprocity theorem can be presented in such a way that the student gets no hint of why it is important (the most commonly used proof is not helpful). I want the author to work at opening up horizons, and particularly so when it comes to the really deep results.

In the end, my choice is *A Friendly Introduction to Number Theory,* by Joseph H. Silverman, a book that works hard to be approachable. Its one fault is the fact that it doesn't include a proof of quadratic reciprocity. But I can supply that. Silverman does a great job of exactly those things I care about: his book is readable; it makes students aware of the role of both experimentation *and* proof; it includes many pointers to deeper questions and even to open questions. Even the jokes are the sort that I would make!

No matter how much I may like a book, the real test happens with real students in a real classroom. My impression is that Silverman's book does what I want it to do. Students can read the book and use it as a complement to what happens in class. (I tell students early on that it is not my plan to transcribe the textbook on the blackboard!) I don't come anywhere near to covering all the material in the book, but that is to be expected.

The reader might object that I cannot possibly have looked at all the number theory textbooks on offer. The reader would be right. Life is too short. It's perfectly possible that I've completely missed some wonderful book. Perhaps one of my readers will let me know about it.

What's the Best Textbook *is the overall title for a series of articles discussing textbooks for mathematics courses. If you'd like to contribute an article (even one contesting the conclusions of this article), please contact the editor at* fqgouvea@colby.edu.

Employment Opportunities

NEW YORK

CORNELL UNIVERSITY
The Cornell University Department of Mathematics invites applications for our Teaching Program Visiting Faculty Positions beginning August 16, 2004. Two or more half-time visiting positions (any rank) for mathematics professors on sabbatical/other leaves from colleges, universities, and engineering schools. Candidates with substantial experience teaching undergraduate mathematics, and with teaching and research interests compatible with current faculty, are sought. Successful candidates are expected to pursue a program of study and/or research at Cornell. For information about these positions and application instructions, see: http://www.math.cornell.edu/Positions/facpositions.html Deadline December 1, 2003.Cornell University is an Affirmative Action/Equal Opportunity Employer.

Advertising Information for Display & Classified Ads

Mechanical Specifications
Trim Size: 8 1/2 " wide x 10 3/8 " high
Screen: 150-line halftone
Full page bleed 8 3/4" x 11 1/4", (10% extra charge)
Color: FOCUS standard second color available (15% extra charge).
Column width: 2 5/16", 4 13/16", 7 3/8"
Printing: Offset, saddle-stitched

How to send your Materials:
Electronic files: Laser output should accompany your electronic files. PC and MAC based files must be sent as Postscript files (please subset and embed all fonts). PDF files are also acceptable.

Camera-ready art: Should be prepared according to the mechanical specifications shown on this page.
Classified Rates (includes a a free listing in MAA Online to appear the same month as the print ad): $2.25 per word.

Contact the MAA Advertising Department toll free at 1-866-821-1221, fax: (703) 528-0019 Classified and MAA Online ads may be sent via email to ads@catalystcom.com.

2003 Grant Funding Available

The Calculus Consortium for Higher Education (CCHE) is a small non-profit public charity which is the outgrowth of an NSF funded project in innovative coursework in undergraduate education (the Calculus Consortium based at Harvard.) The mission of CCHE is to improve the teaching of mathematics in secondary schools, two-year colleges, four-year colleges, and universities. It supports workshops, meetings, conferences or research projects in innovative coursework. With that goal in mind grant requests are hereby being solicited in those four areas. Grants are usually for 1 year and for less than $25,000. Proposals should be less than five pages in length and be accompanied by a budget using NSF Form 1030. They should be sent to CCHE, P.O. Box 22333, Carmel, CA 93922 or Email: cche@redshift.com, Fax: (831) 624-7571 by November 15th for consideration by the Board of Directors in early January. Requests for an earlier review date will be considered on an individual basis. If there are any questions, please contact Thomas Tucker, Mathematics Department, Colgate University, Hamilton, NY 13346, Email (preferred): ttucker@mail.colgate.edu.

New MAA Section Governors for 2003

Kansas	Elizabeth G. Yanik, Emporia State University
Missouri	Leon M. Hall, University of Missouri-Rolla
New Jersey	Reginald Luke, Middlesex County College
Northeastern	Laura L. Kelleher, Massachusetts Maritime Academy
Ohio	Thomas A. Hern, Bowling Green State University
Pacific Northwest	Robert A. Beezer, University of Puget Sound
Southeastern	Benjamin G. Klein, Davidson College
Southwestern	William D. Stone, New Mexico Institute of Mining and Technology
Seaway	Luise-Charlotte Kappe, SUNY Binghamton

MAA Section Meeting Schedule Fall 2003 and Spring 2004

ALLEGHENY MOUNTAIN

March 26-27, 2004-West Virginia Wesleyan College, Buckhannon, WV

FLORIDA

February 20-21, 2004-University of Central Florida, Orlando, FL

ILLINOIS

April 1-3, 2004-Roosevelt University, Schaumburg, IL

INDIANA

October 18, 2003-Goshen College, Goshen, IN

April 2-3, 2004-Indiana State University, Terre Haute, IN

IOWA

April 16-17, 2004-Central College, Pella, IA

KENTUCKY

April 2-3, 2004-Murray State University, Murray, KY

LOUISIANA-MISSISSIPPI

March 4-6, 2004-Southeastern Louisiana State University, Hammond, LA

MD-DC-VA

November 7-8, 2003-Johns Hopkins University, Baltimore, MD
Spring 2004-Salisbury State University, Salisbury, MD

METRO. NEW YORK

May 2, 2004-Nassau Community College (SUNY), Garden City, NY

MICHIGAN

May 7-8, 2004-Oakland University, Rochester, MI

MISSOURI

April 2-3, 2004-Southeast Missouri State University, Cape Girardeau, MO

NEBRASKA-SOUTHEAST SOUTH DAKOTA

April 2-3, 2004-University of Nebraska at Kearney, Kearney, NE

NEW JERSEY

November 8, 2003-Raritan Valley Community College, North Branch, NJ

NORTH CENTRAL

October 24-25, 2003-University of Sioux Falls , Sioux Falls, SD

April 23-24, 2004-Winona State University, Winona, MN

NORTHEASTERN

November 21-22, 2003-Wellesley College, Wellesley, MA

June 3-4, 2004-Roger Williams University, Bristol, RI

NORTHERN CALIFORNIA, NEVADA, HAWAII

February 28, 2004-California State Hayward, Hayward, CA

OHIO

October 17-18, 2003- Ohio Northern University, Ada, OH

March 26-27, 2004-University of Cincinnati, Cincinatti, OH

OKLAHOMA-ARKANSAS

March 26-27, 2004-University of Central Arkansas, Conway, AR

PACIFIC NORTHWEST

June 24-27, 2004-University of Alaska, Anchorage, AK

ROCKY MOUNTAIN

April 16-17, 2004-Colorado College, Colorado Springs, CO

SOUTHEASTERN

March 26-27, 2004-Austin Peay State University, Clarksville, TN

SOUTHERN CALIFORNIA

October 4, 2003-Cal Poly, Pomona, CA

SOUTHWESTERN

April 2-3, 2004-Northern Arizona University, Flagstaff, AZ

SEAWAY

November 7-8, 2003-Rochester Institute of Technology, Rochester, NY

April 23-24, 2004-SUNY College at Cortland, Cortland, NY

TEXAS

April 1-3, 2004-Texas A&M University, Corpus Christi, TX

WISCONSIN

September 26-28, 2003 (Meeting for Project NExT Wisconsin) Bundy Hall Conference Center, Menomonie, WI

April 16-17, 2004-University of Wisconsin-Platteville, Platteville, WI