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FOCUS

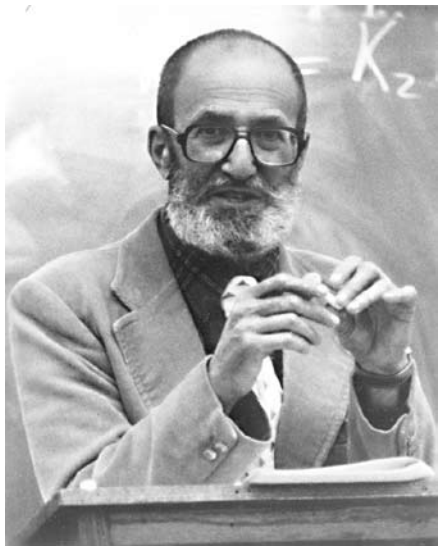
Volume 26 Issue 8

Inside

On the cover: Terence Tao, winner of the Fields Medal and a MacArthur Fellowship. Photograph courtesy of UCLA.

Paul R. Halmos (1916-2006)

Paul Richard Halmos, a major figure in American mathematics died on October 2, 2006 in San Jose, California, after a short illness. Renowned as a mathematical researcher principally in the areas of operator theory, ergodic theory and algebraic logic, but also in probability and statistics, topological groups, and Boolean algebras, he was also one of the pre-eminent mathematical expositors of his day, having written a series of classic texts: *Finite-Dimensional Vector Spaces*, *Measure Theory, A Hilbert Space Problem Book*, *Naïve Set Theory*, *Problems for Mathematicians Young and Old,* to name only a few. These works of his and others inspired generations of students to pursue careers in mathematics.



Paul Halmos

Born in Budapest, Hungary, on March 3, 1916, Halmos at the age of 13 came with his family to Chicago. He attended high school there and later enrolled at the University of Illinois at Urbana-Champaign, from which he received his PhD in 1938, under the supervision of Joseph Doob. From there he went to the Institute for Advanced Study in Princeton for two years, where he served as assistant to John von Neumann. After his years at the Institute he moved to academic positions at Syracuse University; the University of Chicago; the University of Michigan, Ann Arbor; the University of Hawaii; the University of California at Santa Barbara; Indiana University; and Santa Clara University from which he retired in 1995. He had also held visiting appointments at Harvard University, Tulane University, the University of Montevideo, the University of Miami (Florida), the University of California at Berkeley, the University of Washington (Seattle), the University of Edinburgh, Chiao Tung University in Taiwan, and the University of Western Australia.

A brilliant writer and lecturer, Halmos not only wrote roughly 100 research papers, but also 16 books and many book reviews. Several of his books are easily accessible to a non-specialist audience, notably, his memoirs, entitled *I Want to Be a Mathematician: an Automathography,* and a pioneering volume, *I Have a Photographic Memory*, a record of a lifetime of taking pictures of mathematicians.

As a teacher he was extraordinarily effective, usually using a modified Moore method to encourage student participation in the discovery of mathematics. For this he was awarded the Haimo Award for Distinguished College or University Teaching of Mathematics by the Mathematical Association of America (MAA) in 1994.

For the clarity of his writing and his lectures he was even more widely admired. His work was often witty and colorful, indeed provocative at times, but always well-planned and polished. When asked about the importance of computers, he replied that they are important, but not to mathematics. He then proceeded to explain why. And he actually wrote an article entitled "Applied mathematics is bad mathematics." Asked about this, he first replied, "First it is. Second it isn't . . . [Applied mathematics] is a good contribution. It serves humanity. It solves problems . . . but much too often it is bad, ugly, badly arranged, sloppy, untrue, undigested, unorganized, and unarchitected mathematics." Those who knew him learned to check for that mischievous look in his eye when he made statements like these. He knew what he was doing; he was provoking discussion. And provoke discussion he did.

Influential in the mathematical world, he served as Vice President (1981-82) and subsequently on the Council of the American Mathematical Society (AMS) and on the Board of Governors of the MAA. For his outstanding work in mathematics he was awarded the prestigious Leroy P. Steele Prize of the AMS and the Distinguished Service Award of the MAA. For his writing he won the Chauvenet Prize, two Lester R. Ford Awards, and the George Pólya Award, all from the MAA. He served a five-year term as editor of the *American Mathematical Monthly* and held editorial positions for *Mathematical Reviews*, the *Proceedings of the American Mathematical Society*, the *Journal fűr die reine und angewandte Mathematik*, and the *Indiana Journal of Mathematics*. He also edited five book series for Springer Verlag: *Universitexts,* the *Ergebnisse der Mathematik, Problem Books*, *Undergraduate Texts* and *Graduate Texts in Mathematics*.

Though he had roots in Hungary, he always thought of himself as an American mathematician. Hungary nevertheless honored him with membership in the Hungarian Academy of Sciences. Further, he was elected to membership in the Royal Society of Edinburgh. He held honorary doctorates from St. Andrews University, DePauw University, Kalamazoo College, and the University of Waterloo. Among his honors were a Guggenheim Fellowship.

In recent years Halmos and his wife of 60 years, Virginia, were recognized for their philanthropy. In 2003 they gave a $3,000,000 gift to the MAA to develop an existing building in Washington, DC, to become a meetings center. Already in use for various mathematical activities, the center will be dedicated in April 2007. In addition they endowed book prize funds for both the AMS and the MAA.

Halmos is survived by his wife, Virginia, of Los Gatos, California, and a cousin, Ferenc Halmos, of Budapest. In line with Halmos's request, no services are planned.

Terence Tao Receives MacArthur Fellowship

Terence Tao is on a hot streak. In the space of a few months he has won a Fields Medal (see page 6), published a book, and received one of the coveted MacArthur Fellowships, often referred to as the "Genius Grants." A press release from UCLA has one of his colleagues describing him as "like Mozart, mathematics just flows out of him, except without Mozart's personality problems; everyone likes him."

Tao was the only mathematician in this year's list of MacArthur Fellows, which described him as "bringing technical brilliance and profound insight to a host of seemingly intractable problems in such areas as partial differential equations, harmonic analysis, combinatorics, and number theory."

Tao was born in Adelaide, Australia, in 1975. His talent became clear very early, and he excelled in mathematical competitions at a young age. He received his PhD from Princeton in 1996 and is now Professor of Mathematics at the University of California Los Angeles. His mathematical work is very broad, ranging from harmonic analysis and partial differential equations to number theory, with many stops in between. Tao has published more than fifty papers and several books. Though most of his best work is on harmonic analysis and PDEs, he is probably best known for his work with Ben Green showing that there exist arbitrarily long arithmetic progressions of prime numbers.

Tao has just published *Solving Mathematical Problems: A Personal Perspective* (Oxford University Press), which focuses on olympiad-level problems and how to solve them. This is actually a new edition of a book first published in 1992 by a no longer extant Australian publisher. Tao's other books are fairly technical, but this one seems to have the potential for a particularly large audience.

The MacArthur Fellowships are unrestricted grants awarded to brilliant and creative people to allow them to continue to do the things they do so well. The criteria, according to the Foundation, are "exceptional creativity, promise for important future advances based on a track record of significant accomplishment, and potential for the fellowship to facilitate subsequent creative work." The MacArthur Fellowships come with a $500,000 stipend over five years, and have a "no strings attached" policy. The Fellows can come from any area of human endeavor. This year's list of 25 Fellows includes pharmaceutical entrepreneur Victoria Hale, children's book author David Macaulay, jazz violinist Regina Carter, country doctor D. Holmes Morton… and one mathematician.

For more information on Tao, visit his home page, at http://www.math.ucla.edu/~tao/. For more on the MacArthur Fellows, see http://www.macfound.org.

NCTM Releases "Curriculum Focal Points"

On September 12, the National Council of Teachers of Mathematics (NCTM) released a new set of recommendations, entitled "Curriculum Focal Points." The recommendations identify three mathematical topics for each grade, from pre-kindergarten to grade 8, that are particularly important. The goal, according to NCTM, is "more coherence" to mathematics curricula and to provide "a framework for states and districts to design more focused curricular expectations and assessments for pre-K to grade 8 mathematics curriculum development."

Pointing out that states often create their own standards for what must be achieved by students at each grade level, NCTM argues that *Focal Points* can provide a nation-wide consensus on such standards. For example, NCTM recommends that second graders should develop "quick recall" of basic addition and subtraction facts, fourth graders should be similarly fluent with multiplication and division, and seventh and eighth graders should be able to use algebra to solve linear equations.

"Focal Points" was viewed by many as a retreat from NCTM's *Principles and Standards for School Mathematics*, which drove much of the innovation in mathematics curricula over the last few years. The NCTM says that in fact the new recommendations simply clarify their vision for school mathematics.

FOCUS plans to publish articles with more extended analysis of "Focal Points" in a future issue.

Alder Award Nominations Due

Do you know an extraordinarily successful young college teacher of undergraduate mathematics? Nominations for the 2007 Henry L. Alder Awards for Distinguished Teaching by a Beginning College or University Faculty Member should be submitted to the Secretary of the MAA by December 15, 2006. Paper submissions only are accepted, and submissions must conform to the format and eligibility requirements as noted at http://www.maa.org/awards/alder_award.html.

Submission of a nominee not selected in a previous year is welcome provided the nominee still meets the eligibility criteria and the "nomination narrative" and "additional documentation" are revised so as to take into account the additional time of teaching.

Fields Medals and Other Awards at the 2006 International Congress of Mathematicians

Four Fields Medals were awarded on August 22, the opening day of the 2006 International Congress of Mathematicians. The winners are **Andrei Okounkov**, **Grigori Perelman**, **Terence Tao**, and **Wendelin Werner**. The Nevanlinna Prize for contributions to mathematical information theory was awarded to **Jon Kleinberg**. A new prize for contributions to applied mathematics, named for Gauss, went to **Kiyoshi Itô**.

Andrei Okounkov

Wendelin Werner

Andrei Okounkov received the Fields Medal "for his contributions bridging probability, representation theory and algebraic geometry." Okounkov is known for using notions of randomness and of classical ideas from representation theory to attack problems from algebraic geometry and statistical mechanics, among others. Born in Moscow in 1969, Okounkov received his doctorate from the University of Moscow in 1995. After holding positions at many prestigious institutions, he is now professor of mathematics at Princeton.

Grigori Perelman received the Fields Medal "for his contributions to geometry and his revolutionary insights into the analytical and geometric structure of the Ricci flow." Perelman's work provides a way of proving two of the most famous conjectures in geometry and topology: Thurston's Geometrization Conjecture and the Poincaré Conjecture. (See our August-September 2006 issue of FOCUS for more details.)

Perelman was born in 1966 in what was then the Soviet Union. He received his doctorate from St. Petersburg State University. After spending some time in the United States in the 1990s, he was a researcher in the St. Petersburg Department of the Steklov Institute of Mathematics.

John Ball, president of the IMU, announced at the awards ceremony that Perelman had refused the award.

Terence Tao received the Fields Medal "for his contributions to partial differential equations, combinatorics, harmonic analysis and additive number theory."

Terence Tao is a talented problem-solver whose spectacular work has had an impact across several mathematical areas, including harmonic analysis, nonlinear partial differential equations, and combinatorics. Tao was born in Adelaide, Australia, in 1975 and received his PhD from Princeton in 1996. He is now professor of mathematics at the University of California, Los Angeles. See the cover of this issue for a photograph of Tao and page 5 for more news about him.

Wendelin Werner received the Fields Medal "for his contributions to the development of stochastic Loewner evolution, the geometry of two-dimensional Brownian motion, and conformal field theory."

Werner's work deals with some of the most important points of contact between mathematics and physics. He has developed a framework, combining geometric insights and ideas from probablility theory and classical complex analysis, for understanding critical phenomena in physics. Born in 1968 in Germany, Werner is of French nationality. He received his PhD at the University of Paris VI in 1993 and has been professor of mathematics at the University of Paris-Sud in Orsay since 1997.

The Nevanlinna Prize is awarded every four years at the ICM for work in the "mathematics of information theory," i.e., theoretical computer science. This year's prize went to Jon Kleinberg, whose work "has brought theoretical insights to bear on important practical questions that have become central to understanding and managing our increasingly networked world." His work has dealt with many areas, including network analysis and routing, data mining, comparative genomics and protein structure analysis.

Kleinberg was born in 1971 in Boston, Massachusetts, USA. He received his PhD in 1996 from the Massachusetts Institute of Technology and is now professor of computer science at Cornell University.

Kiyoshi Itô is the first winner of the Gauss Prize for applications of mathematics. The new prize is named for Carl Friedrich Gauss, one of the greatest mathematicians of all time, whose work demonstrated the ability to apply mathematics

to many sorts of problems in physics, astronomy and engineering. The prize is awarded jointly by the Deutsche Mathematiker-Vereinigung (DMV = German Mathematical Union) and the International Mathematical Union (IMU), and administered by the DMV. It consists of a medal and a monetary award (currently valued at 10,000 Euros).

Kiyoshi Itô, aged 90, received the prize for his work on stochastic analysis, allowing the study of stochastic processes by means of what are now known as "stochastic differential equations." These have found applications all over science, and also, perhaps most famously, in mathematical finance via the Black-Scholes equations. Though Itô first developed these ideas in the 1940s, it took quite a while for mathematicians to understand and appreciate his results. Only after 1954, when Itô visited the Institute of Advanced Studies, did his ideas begin to have their true impact. Today, stochastic analysis is a basic tool in the study of stochastic processes and plays a crucial role in many branches of applied mathematics.

More information, including descriptions of the winners' work, photographs, and interviews, can be found at the ICM press site: http://www.icm2006.org/press/releases/ and at the site: http://www.icm2006.org/imuawards/ describing the awards to be given at ICM.

Kiyoshi Itô

Perelman and Me

On Tuesday, August 22, 2006 Russian mathematician Grigory Perelman declined the Fields Medal for his contribution to the proof of a well-known and difficult conjecture first posed by Henri Poincaré in 2004. I applaud Perelman's seclusion.

The gravity of the universe
requires dark matter.
Choosing one thought
prevents another.

Little girls learn social graces
to make others feel at ease.
But friendly greetings
are never mathematics.

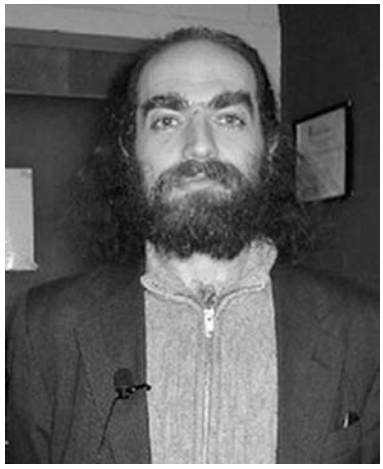
Difficult thoughts
are born in isolation :
genius slips away if socialized—
and so he must refuse the prize.

JoAnne Growney
25 August 2006

The Press is Fascinated by Perelman

By Fernando Q. Gouvêa

Press coverage of the Fields Medals focused almost exclusively on Grisha Perelman, the Poincaré Conjecture, and the fact that Perelman turned down the prize and may, speculates the press, turn down the Clay Institute's million dollar prize when and if it is offered. Some of the news items never even mentioned the other three Fields medalists. The AP headline is fairly typical: "Russian recluse snubs academic world, rejecting math's equivalent of Nobel Prize" (AP Worldstream, August 23, 2006). The *Sunday Telegraph*, on August 20, ran an article that described Perelman as "bonkers."



Grisha Perelman

At the other extreme, Evgeny Morozov in an August 31 op-ed article in the *International Herald Tribune*, described Perelman's fame as "The triumph of the nerd," and hailed Perelman for having concentrated on science, not worrying about funding, politics, or writing op-ed pieces for newspapers. "Perelman has sent a particularly important message to aspiring scientists," Morozov says, "science is still a level playing field**.** No matter what institution you are based at, no matter how much you publish, and no matter what your peers think, it all boils down to hard work and a bit of genius." He ends his article by saying that "If the Clay Institute wants to reinvigorate general interest in science, then it should publicly burn Perelman's prize money. After all, that's what a true Dostoevskian character like Perelman would do with the money anyway."

An editorial in *The Daily Texan* said that "In a world where folks are always looking to sell themselves, Perelman's gesture is powerful. It's old-school, reclusive genius at its finest." Maybe so, but the refusal has probably resulted in greater

fame for Perelman than he would have otherwise had.

A response to the exclusive focus on Perelman appeared a couple of weeks later, again in the *International Herald Tribune*: "Yes, but what about the other math geniuses?", by Malindi Corbel. Agence France-Presse gave it a try with "Number cruncher Tao waves maths flag for Australia," but describing Terence Tao as a "number cruncher" seems quite unfair, and Werner and Okounkov were not mentioned at all. The *Chronicle of Higher Education* entitled their story "3 Professors Win Elite Math Medals," the point being that Perelman, having refused the medal, is not one of the winners. Even so, the article, which is five paragraphs long, spends two paragraphs discussing Perelman's refusal.

The complicated story of Perelman's proof and its relation to the work of other mathematicians, discussed in our September issue, continued to attract attention and discussion. Marcus du Sautoy, writing in *The New Scientist* on August 26, used it as an opportunity to discuss the complex nature of proof and the difficulty of deciding who the actual prover was. The *New York Times* ran a notable article by Dennis Overbye, "An Elusive Proof and Its Elusive Prover" (August 15, 2006). The illustrations accompanying the article were particularly nice, giving the reader a visual demonstration of what the Ricci flow does. The *New Yorker* ran a long article by Sylvia Nasar and David Gruber, "Manifold Destiny," in its August 28 issue. The article is very sympathetic to Perelman and critical of Shing-Tung Yau and his promotion of the work of Huai-Dong and Xi-Ping Zhu, the two Chinese mathematicians who published their own account of the proof. So much so, in fact, that Yau charged the magazine with defamation.

If nothing else, the stream of news surrounding Perelman and the Fields Medals has called attention to the complex politics of the mathematical community, and has played to the media's predilections. As seen by the media, the story is about a lone genius with ascetic tendencies, an "empire builder" who wants at least part of the credit, money offered and money turned down. Who can resist that?

Institute in the History of Mathematics and Its Use in Teaching: Ten Years After

By Janet Beery

Ten years ago, the first of three classes graduated from the MAA Institute in the History of Mathematics and Its Use in Teaching (IHMT). Held from 1995 to 1999, IHMT has provided the greatest impetus for the use of history of mathematics in teaching in the U.S. since Louis Karpinski, David Eugene Smith, and Florian Cajori first popularized the history of mathematics in our country in the early 1900s. Of IHMT's early and continued success, Institute Director Victor Katz says, "We certainly hoped it would be successful, but we have been very pleasantly surprised at the impact we have had. Even in the second year, it was clear that we were having a major impact in the mathematical community."

IHMT Directors Victor Katz, right and Fred Rickey consult their schedules.

Held at American University (1995-97) and Catholic University (1998-99) in Washington, D.C., IHMT included three classes of about 40 mathematics professors each. Institute directors were Victor Katz, of the University of the District of Columbia; Steven Schot, of American University; and Fred Rickey, then of Bowling Green State University and now of the United States Military Academy. Florence Fasanelli served as MAA liaison and was instrumental in obtaining the NSF grants that funded the Institute.

The goal of IHMT was to increase the presence of history in the undergraduate mathematics curriculum by preparing participants to teach undergraduate mathematics history courses and to incorporate history in all of their teaching. IHMT did this and much more, not only getting us started on using mathematics history in all of our courses, but also exposing us to new research in mathematics history, introducing us to original sources, and inspiring many of us to do our own research in mathematics history.

Highlights of the three-week summer sessions included lecture series by outstanding historians of mathematics (for example, in 1999, Eleanor Robson on Mesopotamian mathematics, Harold Edwards on the history of number theory, and Karen Parshall on American mathematics) and field trips to rare book libraries and museums (for instance, in 1997, Smithsonian curator Peggy Kidwell showed us early American mathematical manipulatives and, in 1999, we viewed the Archimedes Palimpsest at the Walters Museum in Baltimore).

Of the many types of activities offered at the Institute, Katz says, "The one that was surprisingly successful was having participants do mini-research projects in history. Many of the participants continued and expanded this work afterwards." Indeed, several participants published their work and many more spoke about their projects at conferences. Participants published articles on the history of such school mathematics topics as multiplication (Berg 2001), quadratic equations (Allaire and Bradley 2001), and related rates (Austin et al 2000). Paul Pasles of Villanova University continued his project on Benjamin Franklin's magic squares, finding at least one previously unknown square (Pasles 2001). Shai Simonson of Stonehill College continued to study and translate the mathematics of Levi ben Gershon and shared his work with teachers (Simonson MT 2000) and researchers (Simonson HM 2000).

Institute Director Fred Rickey identifies another surprisingly successful activity: "Perhaps the biggest surprise of IHMT for me was the interest that the participants took in reading original sources. Victor and I… knew it would be a good idea to have people read some original sources so that they could come to appreciate what historians do. For the same reason, we designed the research projects into the plan. What surprised us was how many people took a serious interest in doing history themselves and how many decided that teaching history courses using original sources was a good idea." IHMT graduates have founded two original source reading groups. Ed Sandifer of Western Connecticut State University started the Readings in the History of Mathematics from Original Sources (ARITHMOS) group, while Dan Curtin of Northern Kentucky University and Danny Otero of Xavier University organized the Ohio River Early Sources in Mathematical Exposition (ORESME) Reading Group.

Katz measures IHMT's success primarily in terms of its original goal of increasing the presence of history in the undergraduate mathematics curriculum, noting, "The greatest successes are simply that so many people are involved with the use of history in the classroom. You see this directly at every Joint Meeting. And so many people have written articles and books that started in their experience at IHMT." There have been lively and well-attended paper sessions on using mathematics history in teaching, often organized by IHMTers, at every Joint Meeting since IHMT began. For the 2007 Joint Meetings in New Orleans,

IHMT Director Steven Schot addressess the group.

IHMT participant Ed Sandifer talks about Euler.

IHMT participant Peter Flusser talks about Euler.

Rob Bradley of Adelphi University and Amy Shell-Gellasch of Pacific Lutheran University have organized a contributed paper session on "Euler in the Classroom."

Examples of IHMT participants' teaching innovations include the following:

- Next summer, Herb Kasube of Bradley University will teach his history of mathematics course for mathematics majors with the added attraction of a trip to England to visit Oxford, Cambridge and Bletchley Park.
- In her mathematics history course, Agnes Tuska of California State University, Fresno, has groups of students critique, research, and present math history-related videos.
- The students in Lynn Reed's calculus courses at the Maggie L. Walker Governor's School in Virginia make annotated timelines and biographical scrapbooks.
- At the University of Redlands, a team of six mathematics majors and I designed and taught an activity-based elementary mathematics history course. One of my teaching assistants went on to design and teach a mathematics history course for the gifted fifth and sixth graders in the Johns Hopkins University Center for Talented Youth program.
- Joanne Peeples of El Paso College helped a team of twelve students write and produce Count Her In!, a play about women in mathematics, both historical and modern. The team presented their play at the 2005 MathFest in Albuquerque.

IHMT graduates also have developed instructional resource materials for others. For example:

- Shirley Gray of California State University, Los Angeles, founded and maintains the National Curve Bank, a mathematics website with strong emphases on both history and pedagogy at http://curvebank.calstatela.edu.
- Amy Shell-Gellasch and Dick Jardine (Keene State College) co-edited the MAA Notes collection *From Calculus to Computers: Using the Last 200 Years of Mathematics History in the Classroom.*
- IHMT graduate Fernando Gouvêa and colleague William Berlinghoff of Colby College wrote the elementary mathematics history text, *Math through the Ages: A Gentle History for Teachers and Others* (Oxton House/MAA).
- Several IHMT graduates served as team leaders for the Historical Modules Project (1998-2001), which produced *Historical Modules for the Teaching and Learning of Mathematics* (MAA), a CD containing eleven sets of historical lesson materials on topics such as geometry, trigonometry, and statistics. IHMTers led writing teams of high school teachers; project directors were Victor Katz and Karen Michalowicz.

Many IHMT graduates, myself included, consider IHMT to have been one of the most important professional experiences of our careers. Fernando Gouvêa quipped, "IHMT has disrupted a lot of mathematicians' careers by making them decide to transform themselves into historians." Patricia Allaire of Queensborough College, a mathematics history PhD candidate when she participated in IHMT, recalls, "IHMT was a defining professional moment for me. I came fresh from passing exams and seeking a dissertation topic, and left well on the way to having one. When Helena Pycior spoke about British symbolic algebra, "I knew I was home." She also cites the impact of IHMT on her teaching: "History now informs all my teaching. Even when I'm not being explicitly historical, history is always there in the form of an anecdote, background material, a face to go with a name, etc."

Besides the intrinsic interest of the subject matter, I believe what made IHMT so successful were the energy and commitment of the directors, invited speakers, and participants; the cooperative spirit of inquiry we all shared; and the

promise IHMT held to improve one's teaching and scholarship. This commitment and cooperation have persisted over the years, with many of us continuing to collaborate on projects. Pat Allaire reports, "At IHMT '95, my research mini-project with Antonella Cupillari was on Artemas Martin. Antonella and I have become great friends and collaborators. We have written and spoken together and individually on Martin." Shirley Gray also identifies the camaraderie of the participants as a highlight of IHMT, saying, "IHMT created a nucleus of like-minded kindred souls who have continued to enjoy knowing and seeing one another after ten years."

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Janet Beery participated in IHMT during 1996, 1997, and 1999. She is professor of mathematics at the University of Redlands. A version of this article appeared in the July 2006 History and Pedagogy of Mathematics *(HPM) Newsletter. Photos courtesy of Pat Allaire, Herb Kasube, and Victor Katz*

IHMT and Historical Modules Project Invited Speakers, 1995-2001

Tom Archibald, *19th century European Mathematics*

Marcia Ascher, *Ethnomathematics*

Ronald Calinger, *Historiography*

Ubiratan D'Ambrosio, *Ethnomathematics*

James Donaldson, *African-American Mathematicians*

Bill Dunham, *History of Mathematical Analysis*

Harold Edwards, *History of Number Theory*

John Fauvel, *Mathematics of England and America*

Judy Grabiner, *Maclaurin and Calculus*

Judy Green, *Women Mathematicians*

Uta Merzbach, *Gauss and his Legacy*

Karen Parshall, *American Mathematics*

David Pengelley, *Teaching with Original Sources*

Kim Plofker, *Indian Mathematics*

Helena Pycior, *British Algebra*

Eleanor Robson, *Mesopotamian Mathematics*

Shai Simonson, *The Mathematics of Levi ben Gershon*

IHMT Reunion

The Institute in the History of Mathematics and Its Use in Teaching (IHMT), the MAA project funded by the NSF from 1995 to 2001, will have a reunion on Saturday evening, January 6, from 6:30pm, as part of the Joint Mathematics Meetings in New Orleans. Although there will not be a formal program, all participants who wish to speak about their IHMT experiences should notify Victor Katz (vkatz@udc.edu). The reunion will include a memorial to Karen Dee Michalowicz, who died in July. All Institute participants, including those who participated in the Historical Modules Project, are welcome to attend, but so we can get an accurate count, please notify Herb Kasube by December 1, 2006. (hkasube@bumail.bradley.edu) if you are coming. More details will be posted on MAA Online.

Alice in NUMB3Rland

By Alice Silverberg

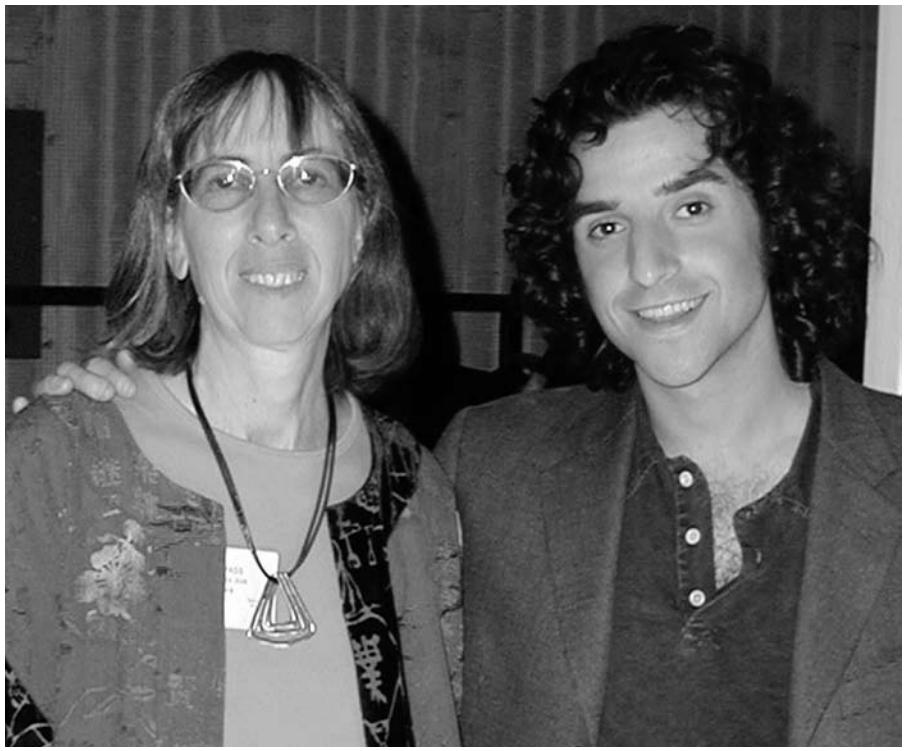
On May 12, over 12 million viewers saw the name of my cat, Ceilidh, flash across their TV screens. Why? Because I'm a consultant for the CBS show NUMB3RS, and a perk was that some of my work, including equations for a cryptosystem called CEILIDH, named in memory of my cat, was the blackboard text in one scene.

The premise of NUMB3RS is that Charlie, a mathematics professor at "CalSci," helps his FBI agent brother solve crimes. Did the CEILIDH cryptosystem have anything to do with that episode's plot? No, not really. Like much of the mathematics in NUMB3RS, it was something that would have made sense if it were in the right context, but it wasn't. Does that matter? Not if you're watching the show for the chase scenes, the acting, Charlie's hair, the family relationships, or to be entranced by the idea that mathematics has an impact on the real world; these are all things that NUMB3RS does very well.

If you're watching NUMB3RS because you think you're learning some mathematics, or because you think you're watching mathematics as it's actually used in the real world, be warned: you're not. Getting the math right and getting it to fit with the plot are not priorities of the NUMB3RS team, according to Cheryl Heuton, one of the show's producers and creators, who correctly points out that few viewers will know the difference.

The popularity of *A Beautiful Mind*, *Good Will Hunting*, *Proof*, and *Arcadia* shows that there is a potentially large audience fascinated by mathematicians and mathematics, with an interest in knowing more. Personally I think they'd prefer authenticity to jargon. But I'll agree with Cheryl that learning mathematics takes time and work, and watching TV isn't the way to do it. That's what schools and teachers are for. However, I'd prefer that the NUMB3RS team value mathematics enough to try harder to get it right.

I became a NUMB3RS consultant for several reasons. I wanted the cryptography and number theory (which are areas I know something about, that can easily be made accessible to the general public) to be more correct and less silly, I wanted to improve the depiction of the female scientists (more scientist and less sex object), and I wanted to help make the representations of mathematics and mathematicians more credible. At the Joint Mathematics Meetings last January the NUMB3RS "researcher" Andy Black gave a presentation followed by a Q&A session, at which I seconded someone else's concerns about the depiction of women and asked how many of their mathematician consultants were female. His answer was "None," so I gave him my contact information, and he called me a couple of weeks later.



Alice Silverberg with David Krumholtz

Typically, Andy emails a draft of the script to the consultants. The FBI plot is already in place, and the writers want mathematics to go with it. The placeholder "math" in the draft is often nonsense or jargon; the sort of things people with no mathematical background might find by Googling, and think was real math. Since there's often no mathematics that makes sense in those parts of the script, the best the consultants can do is replace jargon that makes us cringe a lot with jargon that makes us cringe a little.

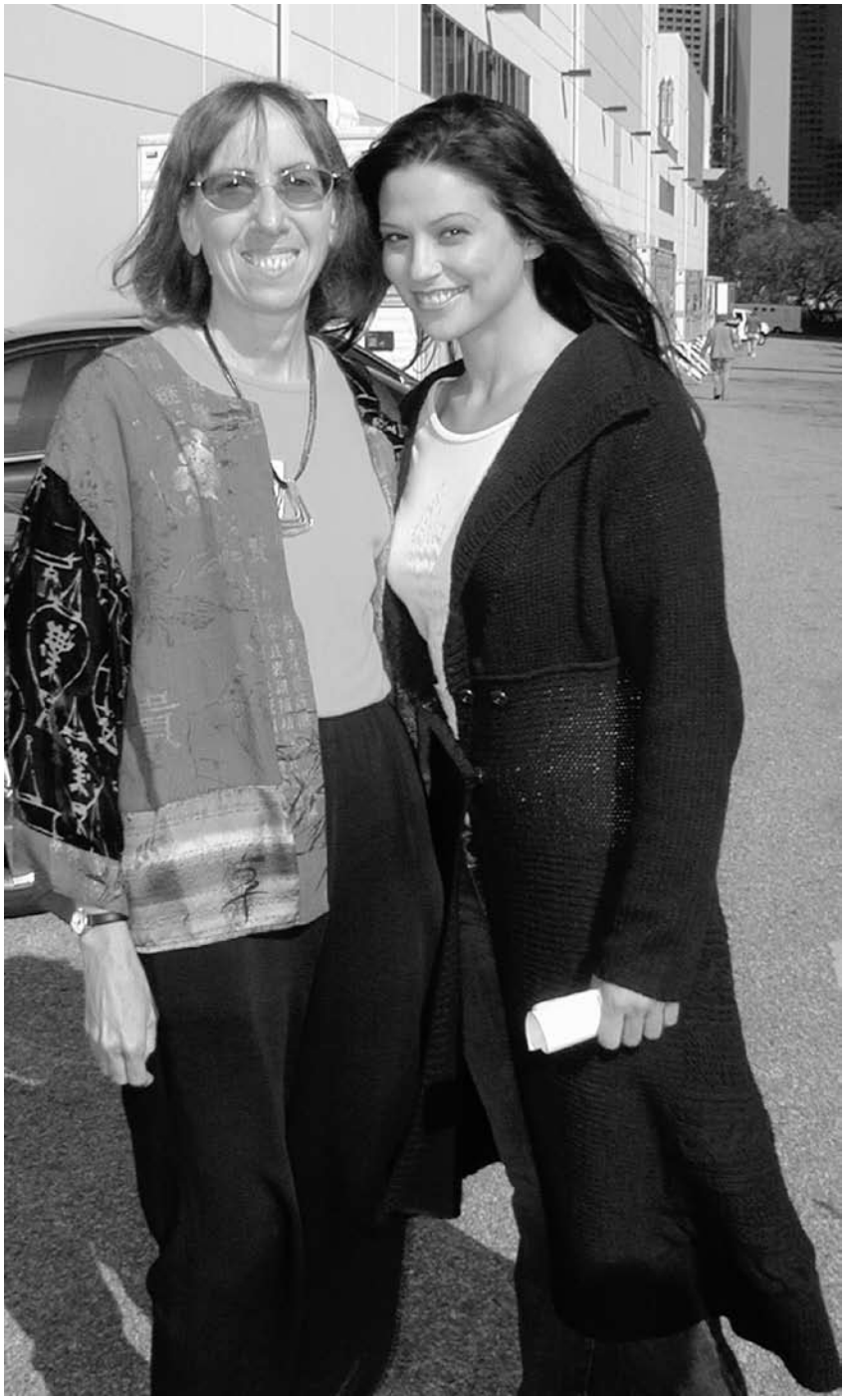
From then on, it's the Telephone Game. The consultants email Andy our suggestions ("replace 'our discrete universes' with 'our disjoint universes'"; "replace the nonsensical 'we've tried everything — a full frequency analysis, a Vignere deconstruction… we even checked for a Lucas sequence' with the slightly less nonsensical 'It's much too short to try any cryptanalysis on. If it were longer we could try frequency analyses, or try to guess what kind of cryptosystem it is and use a specialized technique. For example, if it were a long enough Vigenère cipher we could try a Kasiski test or an index-of-coincidence analysis'"). Andy chooses about a quarter of my suggestions and forwards his interpretation of them to the writers and producers. The script gets changed … and then the actors ad lib something completely different ("disjointed universes": cute, but loses the mathematical allusion; "Kasiski exam": I didn't mean that kind of "test"). More satisfying were occasional phone conversations, including talking with one of the writers, Julie Hébert, about the development of a potential new character.

Seeing the filming of the CEILIDH scene was a real treat. The entire team, especially the actors, came across as

highly professional. I talked with actor David Krumholtz, who was thoroughly charming. I met that episode's writer, Dave Harden (who assured me they'd fix the "Kasiski exam" error), and producer/creator Nick Falacci, who told me that what's great about NUMB3RS is that the math isn't jargon… and didn't seem fazed when I expressed shock that he thought it wasn't jargon. Cheryl was very generous with her time… in which she mostly explained why talking with mathematicians would be a waste of their time.

The NUMB3RS team will do what they think will make people watch. Viewers who care whether the mathematics makes sense or fits the plot, or whether the show depicts life in academia in a realistic way, should make it clear, on fan forums and in letters to the network, that getting the math right will have an effect on whether or not they watch the show. What could NUMB3RS do if there were viewer demand for it? They could hire someone with a mathematics background, whose responsibilities would include helping integrate the plot with the mathematics, communicating more effectively with the consultants, correcting the actors when they ad lib the mathematics in a way that doesn't make sense, checking that words are pronounced correctly, and helping the actors act and dress like mathematicians.

Many professors I've talked to about this would prefer that the character Amita's role were more "The Grad Student" and less "The Love Interest" (under California law Charlie would have undergone two hours of mandatory sexual harassment prevention training and education and should have known that various aspects of his relationship with Amita violate the rules). The NUMB3RS team hasn't been responsive to my comments about that or the depiction of women, or to my complaints about excessive violence (which I believe makes the show inappropriate for the school-age children to whom CBS, Texas Instruments, and the National Council of Teachers of Mathematics are marketing it). Nor was there any interest in changing the CBS website, which has character profiles for all the male characters but none of the female ones, and has Amita's last name spelled in two different ways, both incorrect. (Not to mention that most of the male consultants get paid but the female consultant doesn't.)



Alice Silverberg with Navi Rawat

I have mixed feelings about NUMB3RS. I still have concerns about the violence, the depiction of women, and the pretense that the math is accurate. However, if NUMB3RS could interest people in the power of mathematics enough for society to greater value and support mathematics teaching, learning, and research, and motivate more students to learn it deeply, that would be a positive step.

Alice Silverberg is Professor of Mathematics and Computer Science at the University of California, Irvine.

Archives of American Mathematics Spotlight: The Alfred Schild Papers

By Nikki Thomas

The Alfred Schild Papers at the Archives of American Mathematics (AAM) have recently been reorganized to make this extensive collection more accessible to researchers. Additionally, the archivists created a more detailed inventory of the papers, currently available on the AAM website, and completed preservation work that will ensure the collection's availability to researchers for many years to come.

Alfred Schild (1921–1977) was a mathematical physicist specializing in relativity and gravitation. He was named one of the first Ashbel Smith professors in 1963 and co-founded the first Texas Symposium on Relativistic Astrophysics. He was also one of the founders of the International Committee on Gravitation and General Relativity, the Center for Particle Theory, the Center for Statistical Mechanics, and the Center for Relativity Theory at the University of Texas at Austin. Schild's work concentrated on foundations of relativity, quantization, algebraically special solutions, and conformal techniques. His later research dealt particularly with Fokker action principles and string models of particles.

Schild was born in Istanbul in 1921 to German parents. He received his primary education in England, but was sent to Canada during World War II, where he resumed his education at the University of Toronto, earning both his Bachelor's and Master's degrees. Schild also received his PhD (1946) from the University of Toronto under the direction of Leopold Infeld. He continued his career in mathematics as a professor at the Carnegie Institute of Technology and the University of Toronto before joining the faculty at the University of Texas at Austin in 1957, where he remained until his death.

Undated portrait of Alfred Schild, from the Alfred Schild Papers, Archives of American Mathematics, Center for American History, The University of Texas at Austin.

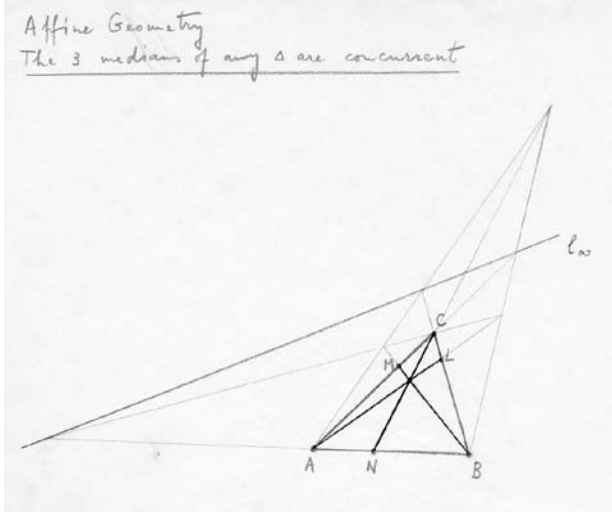


Illustration used by Schild in a projective geometry lecture, from the Alfred Schild Papers, Archives of American Mathematics, Center for American History, The University of Texas at Austin.

This collection consists of eighteen feet of notes and drafts for publications, seminar papers, lecture and teaching notes, grant proposals, literary productions, reprints, photographs, and a sound recording. There are notes, manuscripts, and correspondence relating to Schild's book *Tensor Calculus* (1949), coauthored with J.L. Synge. Schild's work in the founding and administration of the UT Center for Relativity Theory and the Texas Symposium on Relativistic Astrophysics is represented, as are records of his consulting work with Gulf Research and Development. Most of the material is from Schild's years in Texas and the collection is especially strong in documenting the formation and activities of the Texas group of relativists. Major correspondents include P.A.M. Dirac and L. Infeld.

The finding aid for the Arthur Schild Papers is available online at: http://www.lib.utexas.edu/taro/utcah/00480/cah-00480.html.

The Archives of American Mathematics is located at the Research and Collections division of the Center for American History on the University of Texas at Austin campus. Persons interested in conducting research or donating materials or who have general questions about the Archives of American Mathematics should contact Kristy Sorensen, Archivist, k.sorensen@mail.utexas.edu, (512) 495-4539. The Archives web page can be found at http://www.cah.utexas.edu/collectioncomponents/math.html.

L23 A connected $\Rightarrow$ $\bar{A}$, e(A) connected

D8 A is compact if it is a subset of $\bar{B}$ where B contains a finite number of points

D9 The distance between points p and q, d(p,q) = n where n is the length of the minimal chain.

$$\{p\} \smile A_1 \smile A_2 \smile \cdots \smile A_{n-1} = \{q\}$$

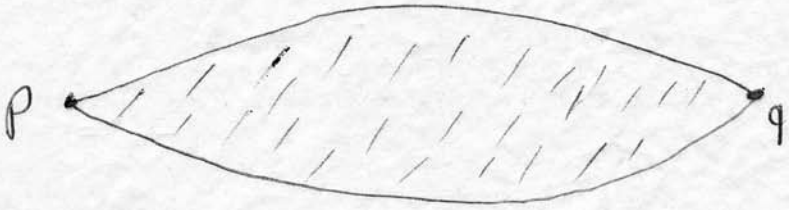
D10 $d(p,q) = n$ where $q \notin e^{n-1}(p)$ but $q \in e^{n}(p)$

D11 d(p,q) = n where n+1 is the least positive integer such that there exists a connected set A with n+1 points for which $e(A) \supset \{p,q\}$, $A \supset \{p,q\}$

L24 D9 $\Rightarrow$ D10 $\Rightarrow$ D11 $\Rightarrow$ D9

D12 Straight line between p and q $=$ $\underset{A \in \mathfrak{A}}{\cup} e(A)$, where $\mathfrak{A}$ is the collection of all connected sets of D11 (d(,q) being n)

rough form of a line between two points p,q.



D13 $A \cdot B = (e(A) \cap B) \cup (e(B) \cap A) = e(A) \cap e(B) \cap (A \cup B)$

D14 $A+B = A \cup B$

L25 $A+B = B+A$

L26 $A \cdot B = B \cdot A$

L27 $(A \cdot B) \cdot C = A \cdot (B \cdot C)$

L28 $(A+B) + C = A + (B+C)$

L29 $A+B \supset A \cdot B$

L30 $A \cdot (B+C) = (A \cdot B) + (A \cdot C)$

L31 $A+(B \cdot C) \subset (A+B) \cdot (A+C)$

L32 $A+(B \cdot C) \not\supset (A+B) \cdot (A+C)$ in general

L33 $A+(B \cdot C) \backsim (A+B) \cdot (A+C)$

L34 $A+A = A \cdot A = A$

L35 $A+\emptyset = A$

Schild's mathematical research notes on geometry without points, from the Alfred Schild Papers, Archives of American Mathematics, Center for American History, The University of Texas at Austin.

Removal From Office: A Proposed Addition to the MAA Bylaws

By Martha Siegel, MAA Secretary

In November 2005, the MAA Board of Governors, in compliance with the provisions of the federal Sarbanes-Oxley Act, passed the MAA Code of Ethics with a Whistle Blower Protection Policy. See http://www.maa.org/ABOUTMAA/whistleblowerpolicy.html.

Given this policy, it is clear that the MAA should have some provision for removal from office. While such a procedure would most likely never be invoked, the Board of Governors agrees that it is necessary to add it to the Bylaws.

The following addition to the Bylaws was approved by the Board of Governors at its meeting in Knoxville, TN on August 9, 2006. It will be presented for approval by the members of the MAA at the January 2007 Business Meeting of the Association in New Orleans, LA.

Note that the first sentence refers to persons appointed to positions. It is ordinarily the President who makes appointments. Persons elected to office are either elected by the Board or by the entire membership of the MAA or by some constituency. Those who are hired are in contractual positions and the removal of such persons is the subject of the final sentence.

Please see the MAA Bylaws at http://www.maa.org/Aboutmaa/bylaws03.html for the procedures for amending the Bylaws as well as the entire text of Article IV.

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Contact Professor Martha J. Siegel, MAA Secretary, at msiegel@towson.edu if you have any comments, questions, or recommendations.

Article IV. 9.
Persons appointed to positions within the Association may be removed from office by the entity that appointed them. Persons elected to office by the Board of Governors, by the general membership, or by the membership of a constituency within the Association may be removed from office by a 3/4 vote of the membership of the Board of Governors, with or without cause, if deemed to be in the best interest of the Association. The vote of the Board of Governors for removal from contractual positions is an authorization for the President or the Executive Director to take the steps necessary for that removal.

New Sessions Added to New Orleans Joint Mathematics Meetings

Highlighting MAA/Tensor Foundation Projects Poster Session, Saturday, 9:00 am - 11:00 a.m., organized by Elizabeth (Betsy) Yanik, Emporia State University, Jennifer Hontz, Meredith College, and Kathleen Sullivan, Seattle University. This poster session is designed to showcase successful programs which have been supported by MAA/Tensor Foundation grants. The objectives of the MAA/Tensor Foundation Program are to; "encourage mathematics faculty to develop projects to increase the participation of women in mathematics; and provide support to project directors." The participants in such programs range in age from university women to high school and middle school girls. It is expected that posters representing a wide variety of programs will be displayed. Possible programming formats include after school clubs, special conferences, mentoring programs, and summer camps. Those who are in the process of constructing an outreach program are especially encouraged to attend this session to acquire valuable insights and tips for designing and implementing a mathematics outreach project. Applications should be submitted to Betsy Yanik, eyanik@emporia.edu by Friday, December 8, 2006.

MathNerds, Moore Method, and Mathematics Education: What do they have in common?", Monday, 1:00 – 2:20 p.m., organized by **W. Ted Mahavier**, Lamar University, and **Laurie O. Cavey**, James Madison University, Through support from the Educational Advancement Foundation, the Meadows Foundation, and the Texas Education Agency, MathNerds has created custom software to link university mathematics education classes with school districts in a way to facilitate training future teachers in the pedagogy of inquiry-based instruction which is the heart of the Moore Method and the MathNerds philosophy. School district students submit questions through the MathNerds system which are routed to students in university classes. These students respond under the guidance of both a mathematics educator and a mathematician, thereby addressing precisely the types of questions that their future students may ask. By learning the MathNerds philosophy for responding to questions, future teachers learn strategies that encourage students to develop deeper understanding of the underlying mathematical principles, thus enabling the students to become better problem solvers. Panelists will include: **Terry McCabe**, Texas State University; **G. Edgar Parker**, James Madison University; **Hiroko Warshauer**, Texas State University; **Max Warshauer**, Texas State University; and **Laurie O. Cavey.**

Teaching and Learning Mathematics in a Computer Algebra Systems (CAS) Enriched Environment: College Algebra to Real Analysis, Monday 9:00 a.m. – 10:20 a.m., organized by Wade Ellis, Jr., West Valley College. Computer Algebra Systems (CASs) have been available for nearly half a century. Many secondary school and college mathematics textbooks contain problems that require the use of CASs, but few courses are constructed with the use of a CAS as an integral part of teaching, learning, understanding, and doing mathematics. This panel will give an overview and examples of such uses in mathematics courses from college algebra to real analysis. Panelists will include Bill Bauldry, Appalachian State University; and Wade Ellis, Jr.

Associate Secretary of the Mathematical Association of America

The Mathematical Association of America (MAA) is seeking applicants for the position of Associate Secretary. The Associate Secretary oversees the scientific programs of the MAA's two national meetings, the Joint Mathematics Meeting, held together with the American Mathematical Society (AMS), and the MAA summer meeting, MathFest. Additional responsibilities include participation in meeting logistics and on-site support. The Associate Secretary is elected by the Board of Governors for a five-year, renewable term and serves as a member of the Board. The Associate Secretary meets with the Executive Committee and works closely with that body, with particular AMS officers, and with the MAA and AMS meetings staff. He/she chairs the MAA MathFest Management Committee and alternates chairing the Joint Meetings Committee with the AMS Secretary.

The Associate Secretary has the primary responsibility of putting together sessions and securing invited speakers for the scientific programs of the national meetings, overseeing the organization of mini-courses and short courses, social events, and all other activities held in conjunction with the meetings. In order to do so, he/she works closely with the various meetings committees and with the Council on Meetings. The position requires travel to the national meetings including the Executive Committee and Board of Governors meetings which precede the program, attendance at two additional Executive Committee meetings at MAA Headquarters, and some additional travel to meeting sites. The Associate Secretary works closely with staff on logistics, meetings schedule and program book, budgets, and other management issues.

The Associate Secretary of the MAA must be organized, flexible, affable, persistent, and patient. He/she must be able to make difficult decisions and communicate them tactfully, solve problems quickly, and be resourceful. Familiarity with mathematical programs, broad knowledge of the community, and previous relevant experience are desirable.

The new Associate Secretary will spend at least one year as Associate Secretary Elect before taking office as Associate Secretary in February 2009. Compensation and expenses are negotiable and dependent on the requirements and practices of both the MAA and one's home institution. The position is part-time but requires a commitment of time distributed throughout the year.

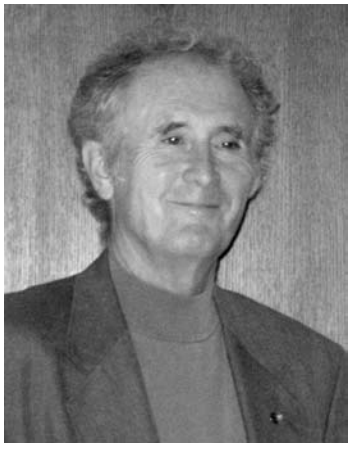
The mission of the MAA is to advance the mathematical sciences. The MAA, with over 27,000 members, is the largest professional association with a focus on mathematics that is accessible at the undergraduate level. Membership includes college and university faculty and students, high school teachers, individuals from business, industry and government, and others who appreciate mathematics.

Send resume and letter describing interest in the position and relevant experiences to:

Associate Secretary
Search Committee
Mathematical Association of America
1529 18th Street, NW
Washington, DC 20036
email: ceuving@maa.org
fax: 202-387-5948

Applications from individuals from underrepresented groups are encouraged. Additional information about the MAA may be found on MAA's website: www.maa.org. AA/EOE.

Two More Sections Present 2006 Winners for Distinguished Teaching



Dave Appleyard
Carleton College
North Central Section

Farley Mawyer
York College (CUNY)
Metro New York Section

Two SIGMAAs to Hold Business Meetings in New Orleans

SIGMAA on Statistics Education Business Meeting
Saturday, 5:45 p.m. – 7:00 p.m.
Organized by Ginger Holmes Rowell, Middle Tennessee State University.

SIGMAA on Mathematical and Computational Biology Business Meeting and Reception
Saturday, 5:45 p.m. – 7:00 p.m.
Organized by Eric Marland, Appalachian State University.

Mathematics Teaching and American Competitiveness

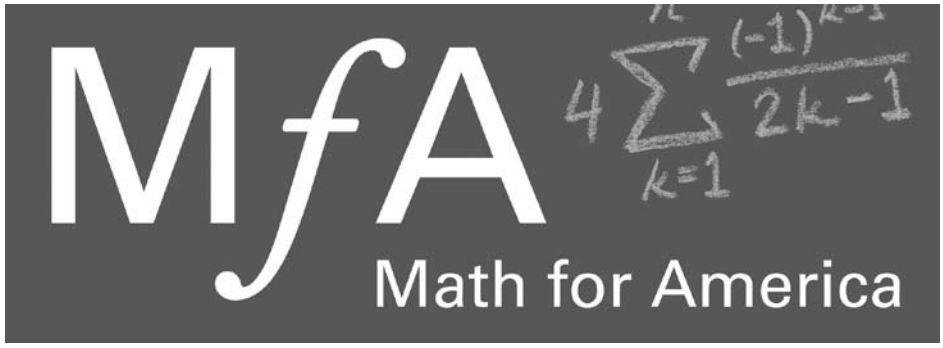
By Irwin Kra and W. Garner Robinson

Only rarely does the same issue affect both our economic well being and the very nature of our democracy. The United States is beginning to lose its competitive edge in science and technological innovation. After creating much of the Internet, we are now 16th globally in broadband deployment. In 2004 China exported $31 billion more in information technology than we did. The US graduated only 70,000 engineers last year, compared with almost one million from China and India. As a society, we have not lost our appetite and need for technological innovation, but we are simply not preparing enough of our young people for careers in these fields.

At the heart of the problem is the dwindling supply of well-prepared elementary school students ready to do high school work and consequently a dwindling supply of high school students prepared and inspired to go on to receive university training in science and mathematics. And that in turn is primarily due to the dwindling supply of public elementary and secondary school teachers who are knowledgeable in math and science.

Improving the teaching and learning of high school math and science is a key ingredient in reinvigorating American competitiveness. Without a major investment in recruiting excellent teachers, we will continue to lose ground compared to other nations. And once these excellent teachers enter the classroom, they must be well rewarded for their valuable contribution to our economy.

Teachers' salaries, unlike, for example, pay scales for mathematically competent financial analysts or professional baseball players, are not tied to market forces. Meaningful incentives, buttressed by comprehensive resources from the federal government, first to attract more qualified individuals into math and science teaching, and then to keep them there, seems the only practicable option.



In 2004, a group of mathematicians and investment bankers formed Math for America (MfA). In less than two years MfA has launched two privately funded New York City programs. The Newton Fellowship Program offers aspiring math teachers a stipend of $90,000 over a five year period as an incentive to enter the profession. The stipend is in addition to the regular salary while teaching. Newton Fellows also receive a full tuition scholarship to earn a master's in math education as well as mentoring and professional development opportunities. A second MfA initiative, the Newton Master Teacher Program, rewards excellent math teachers already in the field with $50,000 in stipends.

The success of MfA's pilot programs has generated a national initiative. On February 7, 2006, legislation based on MfA's Newton Programs was introduced in Congress. The Math Science Teaching Corps Act of 2006 (MSTC, pronounced "mystic") is bipartisan, bicameral legislation offered in the Senate by Charles Schumer (D-NY) and in the House by Jim Saxton (R-NJ).

The MSTC legislation creates a federal fellowship program to recruit, train, and retain outstanding math and science teachers. The proposed Corps will recruit excellent new teachers and reward gifted teachers already in the field, ensuring that they remain in the classroom. Content knowledge is a key to success for any teacher, and prospective Corps members will be screened through a rigorous admissions procedure that includes a national test endorsed by the National Academy of Sciences. The program's goal is to eventually involve 20% of our nation's secondary public school math and science teachers.

A program of the type envisioned will not be cheap. In a steady state, reached five years after the Corps is established, it will cost approximately $1.75 billion annually. It will also, however, reverse America's precipitous educational decline and prepare our students to succeed in the highly competitive economy of the 21st century.

Other proposals have been offered by leaders of both political parties. President Bush has recommended the creation of an Adjunct Teacher Corps to recruit tens of thousands of new teachers and also proposes to train current teachers for advanced placement courses in math and science. Similar legislation to upgrade the knowledge and skills of K-12 teachers has been introduced by Senators Lamar Alexander (R-TN) and Jeff Bingaman (D-NM), as well as by Congressman Bart Gordon (R-TN), and by Senator Edward Kennedy (D-MA).

Of the many bills now before Congress, only MSTC provides a sufficiently broad fellowship program and stipends

at a competitive level. MSTC does not waste taxpayers' money. It insists that Fellowships directly award only those who are great teachers and those who will become great teachers. The competition for Corps membership will be an open process based on sophisticated screening and a national content knowledge test in math and science. There can be no doubt that the key to better prepared students is better prepared teachers. Of the proposals under consideration, only MSTC requires sophisticated content knowledge testing.

It is not critical that Congress enact a program exactly like that proposed by the MSTC legislation. To be successful, a program to improve the teaching force must require appropriate content knowledge of teachers that is verified by a standard test and must provide appropriate financial incentives to those who have the option of choosing among career paths. Our economy requires a technically proficient workforce; our democracy demands a well educated electorate. We have no time to waste.

Irwin Kra is a Distinguished Service Professor Emeritus at Stony Brook University and the Executive Director of Math for America. W. Garner Robinson is a Program Associate at Math for America. For information on applying for a Newton Fellowship as well as to find out how you can support MfA and MSTC, visit http://www.mathforamerica.org.

Teaching Time Savers: Reviewing Homework

By Jane Murphy Wilburne

The classroom practice of assigning homework is a necessity to reinforce the topic of the day's lesson, review skills and practice them in a variety of problems, or challenge students' thinking and application of the skills. Effective mathematics teachers know how to choose worthwhile assignments that can significantly impact students' learning and understanding of the mathematics. The challenge, however, is how to manage and review the assignments in a manner that will benefit students' learning, and use classroom time effectively.

Over the years, I have tried various approaches to reviewing and assessing students' homework. Collecting and grading every students' homework can be very time consuming, especially when you have large classes and no graduate assistants to help review students' work. On the other hand, while it is important to provide students with immediate feedback on their homework, it does not benefit them much to have the professor work out each problem in front of the class.

I believe it is important for college students to take responsibility for their learning. By promoting opportunities for them to communicate with and learn from each other, we can help students come to rely less on the professor to provide them with all the answers, and teach them to pose questions that enhance each others' understanding.

One technique that has been effective in my classes is to assign homework problems that vary in concept application and level of difficulty. The students were instructed to solve each problem and place a check (√) next to any problem they could not solve. As the students entered class the next day, they would list the page number and problem number of the problems they could not solve, on the front board in a designated area. If the problem was already listed, they placed a check (√) next to it. Once the class started, they were not allowed to record problem numbers at the board. Other students, who were successful in solving these problems, immediately went to the board when they entered the class, indicated that they would solve one of the listed problems, and worked it out in detail. When they finished they signed their name to the problem.

By the time I entered the classroom, students were busy solving problems at the board while others were checking their homework at their seats. If there were any questions about the problems, the student who solved the problem at the board would explain his work to the class. If there was a problem in which no one was able to solve, I would provide a few details about the problem and reassign it for the next class. In a short period of time, all homework was reviewed, and I recorded notes as to which students posted solutions on the board. Rather than collecting every student's homework, I noted the problems that gave most students difficulty and would assign similar problems in a future assignment. Students who listed the problems they had difficulty with were not penalized. Instead, those who solved the problems would receive a plus (+) in my grade book. A series of five pluses (+) would earn them a bonus point on a future exam.

My classroom quizzes would always include several homework problems to help keep students accountable for completing their assignments and motivate them to review problems they had difficulty with. Those who did typically received an A!

Time spent in class: approximately 5-12 minutes reviewing the homework. **Time saved:** about 30 minutes per class

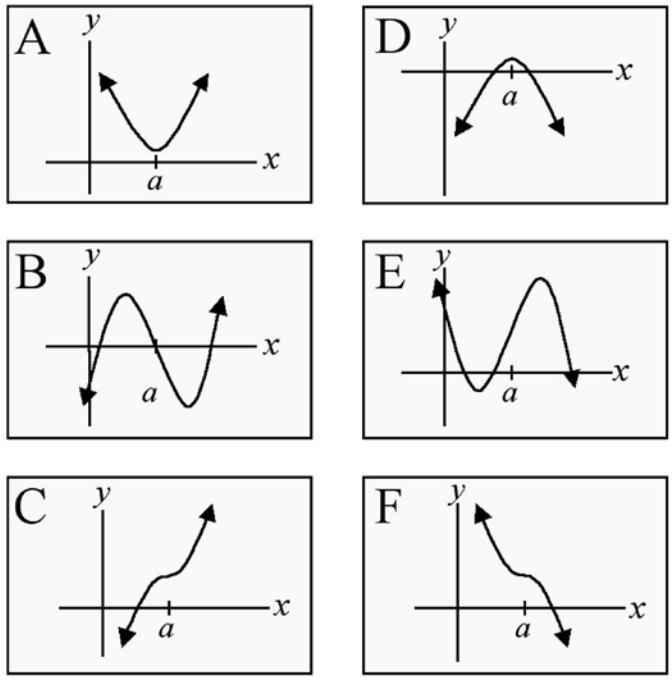
Jane M. Wilburne is assistant professor of mathematics at Penn State Harrisburg.

Teaching Time Savers are articles designed to share easy-to-implement activities for streamlining the day-to-day tasks of faculty members everywhere. If you would like to share your favorite time savers with the readers of FOCUS, then send a separate email description of each activity to Michael Orrison at orrison@hmc.edu. Make sure to include a comment on "time spent" and "time saved" for each activity, and to include pictures and/or figures if at all possible.

What I Learned about the Process of Change: A College Instructor's Reflections

By Lyn Riverstone

In a *Mathematics for Business and Social Sciences* course, 60 students in small cooperative groups discussed the graphs of 6 functions they had been given on cards labeled (A) through (F), which they sorted into piles, according to common characteristics of their own choosing. When they finished, they described how the functions they had grouped together were *different*. The students had to explain their thinking to the whole class at the end of a 15-minute discussion with their group. Each group's discussion was lively as students discussed which characteristics to focus on, how many different "types" the graphs could be sorted into, and which ideas from class were relevant to this task.



Graphs of functions used for the sorting activity in a Mathematics For Business and Social Sciences class.

Several of the groups began their sorting process by looking at the entire graph of each function, putting those with a similar "shape" together, while others focused on the point $x = a$ in each graph, noting that some have a relative extreme point at a, but others don't. Several groups noted a common characteristic between several of these functions is the change in concavity at a. Next, the students looked for differences among the graphs they had grouped together. Throughout these discussions, students used the powerful language of calculus (slope, derivative, concave up, relative maximum, etc.) to describe the graphs and explain their reasoning.

Throughout, the students were struck by the number of possible ways to sort these functions, as well as to describe their differences. After a few groups presented their work, I ended the class period with a brief summary of what had been said and pointed out how all three student presentations were connected. For example, one group had discussed the inflection point of graph (C) while another had pointed out that the second derivative at a in this graph is equal to zero.

Reflecting upon this lesson, I felt I had met my goal of providing students with an opportunity to review recently introduced concepts without doing their thinking and organizing for them. What was most striking to me about this particular day in class, however, was how drastically different a "review" might have looked only a few years before. Probably, students would have sat quietly in rows, watching me draw graphs of functions that all had some common characteristic, already sorted for them, as I noted differences. They would have taken notes, hoping to get down what might be on the test. There would have been little opportunity for them to use new vocabulary, to construct meaning for themselves, or to even voice their confusion or questions.

Reflections on Those Beginning Years

As a new college instructor, I taught the way I had been taught. I lectured every day, assigned practice problems from the textbook, and gave regular quizzes and exams. Due to my inexperience and lack of confidence, I relied heavily on the textbook for content, sequencing, and choice of exam questions. I often chose test questions that were very similar to ones students had solved in homework or had observed me solve during a lecture, and modeled what I expected from my students in terms of showing work and justifying answers. In short, I showed or told my students how to do something, they practiced being good at doing it, and finally I tested them to be sure they could answer questions and justify their answers.

During those early years, I had excellent teaching evaluations. Students commented that I had a strong understanding of the mathematics I taught; I put mathematics into plain words that were easy to understand; I explained concepts in different ways; I helped them understand concepts they had never before been able to grasp; I was patient and available;

and I cared about their success. Most of my students learned the mathematics I taught them, and came away from my class with what I thought of as a deeper understanding of mathematics. Based on all of this, I thought of myself as a good teacher. Then, I began teaching the *Foundations of Elementary Mathematics* courses, a year-long sequence for pre-service elementary school teachers, which transformed my idea of what it means to be a good teacher.

The Process of Change Begins

In these courses, I lectured about standards-based pedagogical practices, but did very little modeling of that way of teaching. One day, as I demonstrated how to use fraction bars to model fraction addition, I began to realize that something did not feel right. Why was I telling my students how to use manipulatives with children rather than giving them an opportunity to have their own hands-on experience? Were proven instructional strategies effective in teaching school-aged children also appropriate at the college level? At first, I thought the answer had to be "no." Otherwise, why were so many of my colleagues teaching in the traditional lecture mode?

Fortunately, one professor in my department was sympathetic when I approached him with my ideas for moving away from a lecture-based format toward a collaborative learning model. I wanted my students to engage in serious mathematical thinking, rather than passively watch me solve problems on the chalkboard. His enthusiastic response prompted me to take the leap — stepping out of my comfort zone and beginning to try some new pedagogical approaches. It was scary, but I was excited about improving my teaching!

With very little knowledge of what researchers in the field of mathematics education have found to be the "best practices" for teaching math, I relied on my instincts at first. My gut and experience told me that students learn more when they are allowed to work collaboratively with others to investigate mathematical ideas and solve problems. I also realized that talking about mathematics (what I later learned is referred to as "mathematical discourse") engages students in the learning process and hence has a more profound impact on their achievement. Incorporating 5- to 10-minute small-group discussions of homework problems before my lecture each day, I made my first baby step toward my goal of changing my teaching practice. In the six years since then, I have made a lot of other changes that have, I believe, improved my teaching practice immensely.

What I Learned

Peer observation and discussion is a catalyst for change. Talking with and observing experienced instructors was the single most important factor influencing my ability to make lasting and worthwhile changes to my practice. Working in isolation makes change difficult, while working with the support of a community makes it easier to face the fear, frustrations, and, even fun, of many a significant change. I sought out colleagues, with a shared interest in change. I attended conferences with a focus on teaching, which also helped transform my teaching practice. Improving my practice became not so overwhelming when I realized I didn't have to be afraid to use other people's ideas.

Incremental changes make the process of transformation less daunting. In the beginning, I decided I wanted to incorporate more active learning and student discourse into my practice, so I started with the homework discussions only. Continuing with this goal the next year, I began devoting entire class periods to collaborative learning assignments, leaving lectures to only one day a week. These days, I rarely lecture; instead I try to guide my students, providing tasks I believe will be worthwhile, facilitating their discussions about the mathematics, and asking questions that may help extend their thinking. These changes have had such a positive impact on my students' learning and attitude toward mathematics that I've become even more open to change.

In recent years, I've experimented with assessment (e.g. rewriting textbook exam questions to better reflect the kinds of activities students had done in class, choosing problems that require more original thought than simply regurgitating), assignments (e.g. assigning less drill and practice and more problem-solving tasks, written reflections and journals), and collaboration (e.g. having students work together in pairs and outside of class on group projects.) Some of these changes have been successful while others have not fit well with my personality or comfort level. Nonetheless, I continue to try innovative practices as I learn about them.

Revisiting and attending to old habits are crucial to maintaining change. It can be challenging and even frustrating to break old habits and to form new ones, especially when the old habits "work." I have had a hard time letting go of "control" of my students' learning and have not believed they could really do mathematics. I was ready to jump in at the slightest sign of difficulty. Nearly every day, I must remind myself that students will learn more if I allow them to struggle with the process of doing mathematics. Even though the process might feel easier (no caring teacher enjoys seeing her students in the midst of struggle), I must remember that the outcome for my students is so much more rewarding for everyone if I don't tell them what to do.

Focusing on those things that are in my power to change is essential. Many argue that NCTM-recommended changes are not possible at the college level. Class sizes can reach 100 to 300 students, there is not enough time to cover the material in the syllabus, students are underprepared, etc. I have no control over these situations, but rather than give up, I focus on the pedagogical pieces I can manage, such as requiring students to show and explain their thinking on some exam questions, rather than relying only on multiple-choice. Online discussion boards provide students opportunities to discuss concepts and problems that may not be possible on a daily basis in large sections. Another idea for engaging students, which I have yet to try, is a wireless response system in which students use a remote control to respond to questions posed by the professor. Once students have responded, the anonymous results can be displayed for all to discuss. This helps meet the needs of students in large sections because the pace of the lecture

can be adjusted depending on student responses.

Transparency can help to involve students in the change process. Being honest with my students about the changes I am trying to make has helped everyone feel more comfortable. I may say, "I learned this at a conference last week and would like to try it, because I think it will really help organize our conversations around this concept. This is new to me, so please bear with me as I figure it out." I've found that students are very understanding and will often let me know when a new technique or assignment is working or not, and may offer advice for improving it the next time. I've even provided students an opportunity to comment anonymously about something new I have tried in the classroom. Students appreciate the opportunity to give feedback about their course.

Teachers often expect perfection from themselves, and appearing to be anything less than an expert is sometimes uncomfortable. However, we serve as models of life-long learning when we are up front about our own attempts to improve our teaching practice.

The Next Phase

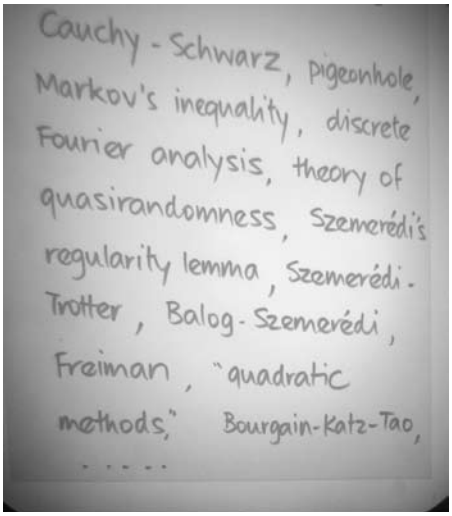
Making changes to my teaching practice has not been easy; nonetheless, I look forward to the challenges of continuous self-improvement that comes with each new school year. I will continue to collaborate with my colleagues, attend conferences and take advantage of other professional development opportunities. In fact, I am organizing a faculty learning community in my department as a means for improving my own teaching practice as well as helping my colleagues to make changes themselves. Through inquiry, dialogue and reflection, we will help one another solve problems related to teaching, examine the "best practices" of teaching mathematics, look collaboratively at student work to better understand student thinking, establish informal mentoring relationships, and work together on peer observations.

This year, I also plan to focus on issues of equity in my classroom by trying to create a safe environment for discourse to occur, thinking more carefully about how to group students, using group roles and enforcing them, allowing and honoring private think time, and relying on protocols that encourage every member of a cooperative group to contribute in meaningful ways. I know that not every new thing I will try will be perfect – I will see not failures, but invitations to try again. Breaking the habits of a lifetime is a huge challenge, so I will continue to set attainable goals and make incremental changes that help me reach those goals as I work to get better at this complex work of teaching. Though I will continue to face the challenges that go along with teaching large classes at a university, if I am honest with my students and myself, my teaching practice can do only one thing – improve!

Lyn Riverstone teaches in the Mathematics Department at Oregon State University. She has been interested in mathematics education and the preparation of teachers for many years. *The Oregon Collaborative for Excellence in the Preparation of Teachers (OCEPT II), funded by a National Science Foundation grant 0222552, provided the financial and collegial writing support through a WRITE ON! writing retreat to help make this article possible.*

MathFest 2006, Knoxville, Tennessee

The 2006 MAA MathFest was held on August 10–12 in Knoxville, TN. The 1000 participants had access to a very wide range of activities and programs, from the Hedrick Lectures to a Dinner Cruise on the Tennesse River. As always, the MAA Board of Governors met the day before the meeting, and a formal Business Meeting occurred on the last day, which was concluded by the traditional "Silver and Gold Banquet" honoring those present who have been members of the Association for 25 or more years.

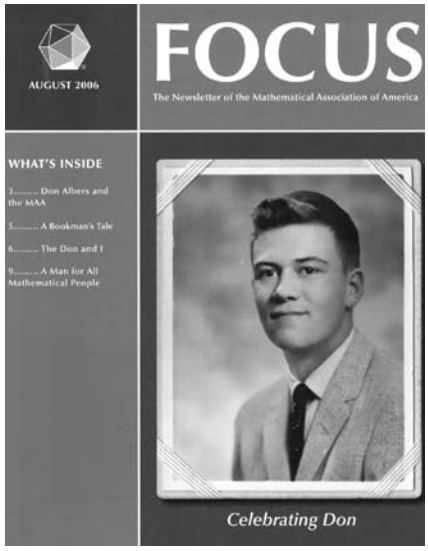


The arithmetic combinatorialist's toolbox, according to Tim Gowers.

The main scientific event at MathFest is always the three Hedrick Lectures. This year, the lecturer was Tim Gowers, the Rouse Ball Professor of Mathematics at the University of Cambridge and Fields Medalist. His topic was Arithmetic Combinatorics. Gowers' first lecture introduced the subject by presenting sample theorems and open problems. The second and third lectures presented further details and recent results. Those who attended appreciated Gowers' insight and his ability to share the "insider's view." For example, he observed that the essence of such results as Green and Tao's recent theorem about arithmetic progressions of primes lies in "showing that the primes have enough randomness that they behave as we would expect them to behave." He also displayed an impressive "basic toolkit" for researchers in the subject.

Another important event at every MathFest is the Leitzel Lecture, which typically deals with some topic related to mathematics education. This year's Leitzel Lecturer was Francis Su of Harvey Mudd College, whose title was "Teaching Research: Encouraging Discoveries." We learned about the "Mathematical YAWP" and how to cultivate it in our students.

As noted in previous issues, Don Albers has left his position as Associate Executive Director of the MAA and its Director of Publications and Electronic Services. He will continue to direct the MAA's book publication program, but his other duties will pass to a new Director of Publications for Journals and Communications. An appreciation banquet for Don was held on Friday, August 11. The banquet included a skit by Colin Adams and Misha Chkhenkeli, "Magnum PI" (we soon learned that PI stood for "principal investigator"). Richard Guy, Tom Banchoff, Lang Moore, Underwood Dudley, and Elaine Pedreira spoke about Don's work at the MAA. Those present received a copy of a special tribute issue of FOCUS, dated August 2006, and so the only August issue of FOCUS ever to be published (soon to be a collector's item).



Special issue of FOCUS

MathFest is also the setting for the presentation of several of the MAA's most prestigious writing awards. See page 26 for the winners.

Don Saari

Of course, there were hundreds of other events, including "Math Jeopardy," Project NExT events, invited addresses by Dorothy Buck, David Bressoud, and Jesus De Loera. The Student Lecture was presented by Richard Tapia, the NAM David Blackwell Lecture by Johnny Houston, the PME J. Sutherland Frame Lecture by Don Saari, and the AWM-MAA Etta Z. Falconer Lecture by Trachette Jackson. There were countless contributed paper sessions, panels, and special activities.

At the Board of Governors meeting, a minor change to the MAA's Bylaws was proposed and accepted. Final approval will be required at the January 2007 Business Meeting in New Orleans. See page 16 for specifics.

The next few pages present a photographic record of the meeting. (Photographs by Richard Hamilton and Fernando Q. Gouvêa)

MathFest 2006 in Pictures

A packed house at Dorothy Buck's MAA Invited Address.

Jim Daniel and John Kenelly at the Board of Governor's Meeting.

The Knoxville Convention Center

Lida Barrett and Martha Siegel puzzle out a cellphone

Yes, Virginia, Joe Gallian really moves this fast.

Ed Sandifer is pretty fast himself.

The coffee table at the exhibit hall was decorated with mathematical themes.

Doug Ensley gives a talk.

At the riverboat cruise.

Trachette Jackson, 2006 Falconer Lecturer.

Tom Banchoff prepares a geometrical model for a talk.

Tim Gowers during one of his Hedrick Lectures.

Student Speakers

Running a meeting is hard work: Jim Tattersall looking serious.

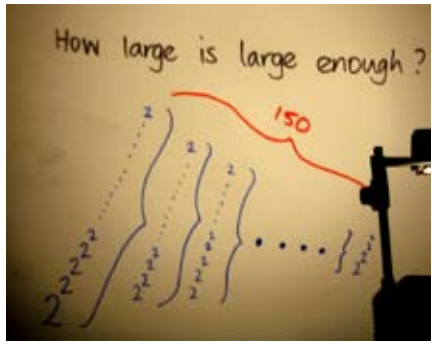
Allen Schwenk, editor of the Mathematics Magazine, *has stars in his eyes.*

Lowell Beineke, editor of the College MathematicsJournal.

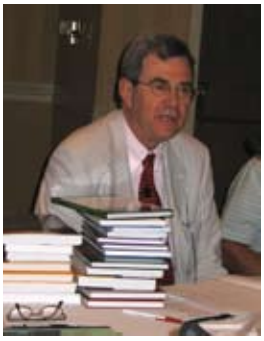
Bruce Palka, guilty of editing the American Mathematical Monthly *for the last five years.*

The mathemagician in action at the opening banquet.

Magnum PI (as in Principal Investigator) showed up at the Don Albers banquet.



Is it large enough for you?



Don Albers shows off new MAA books to the Board.

The Robert Carden Art booth in the exhibit area.

Johnny L. Houston, 2006 Blackwell Lecturer.

Prize winners wait for the awards session to start. Shining sneakers were optional.

The MAA Board of Governors at work...

The Opening Banquet drew a huge crowd.

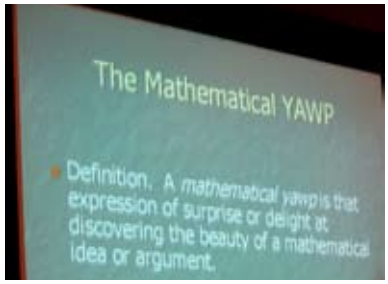
Ezra Brown

Richard Guy speaks at the banquet in honor of Don Albers.

…and at play.

Dan Velleman, editor-elect of the American Mathematical Monthly, *and Bruce Palka, who will be editor until December.*

John Osoinach



Francis Su defines the mathematical YAWP.

Dan Curtin proudly wears his "MAA Governor" pin.

The MAA booth at the exhibit hall.

MAA Prizes and Awards Announced at MathFest 2006

The awarding of prizes for expository writing has long been one of the high points of MathFest. The writing prizes correspond to the four main MAA publications: the Lester R. Ford Award honors papers published in the *Monthly*; the Carl B. Allendoerfer Award is for papers published in *Mathematics Magazine*; the George Pólya award recognizes exceptional papers published in the *College Mathematics Journal*; and finally the Trevor Evans Award highlights the best papers published in *Math Horizons*. All of the awards focus on the previous year of publication, in this case 2005. Award winners receive both a certificate and a (small) monetary prize.

Recently, two new prizes have been added to the regular MathFest list: the Henry L. Alder Award, a teaching award for new college professors (see the call for nominations on page 5), and the Annie and John Selden Prize, for research in undergraduate mathematics education. These allow the Association to continue to encourage the study and improvement of the collegiate teaching of mathematics, which is just as central to the MAA's mission as top-quality expository writing in mathematics.

The awards were announced at a special MathFest event held on August 11, 2006. MAA President Carl Cowen and Secretary Martha Siegel presided over the ceremony. As always, it was a happy and festive event, with most of the winners present and able to respond in person to their awards. (Award recipients whose photos do not appear below were unable to attend.) The full prize booklet, which includes citations and responses by the winners, is available online at http://www.maa.org/news/mfawards06awards.html.

Carl B. Allendoerfer Award

For articles published in *Mathematics Magazine*.

Robb T. Koether and John K. Osoinach, Jr.

Robb T. Koether and John K. Osoinach, Jr.
for "Outwitting the Lying Oracle"
Mathematics Magazine, V. 78
May, 2005, pp. 98-109.

Jeff Suzuki
for "The Lost Calculus (1637-1670): Tangency and Optimization without Limits"
Mathematics Magazine, v. 78,
December, 2005 pp. 339-353.

Trevor Evans Award

For articles published in *Math Horizons*.

Ronald Barnes and Linda Becerra
for "The Evolution of Mathematical Certainty"
Math Horizons, September 2005, pp. 13-17

Stuart Boersma
for "A Mathematician's Look at Foucault's Pendulum"
Math Horizons, February 2005, pp. 19-21, 32.

George Pólya Award

For articles published in the *College Mathematics Journal*.

Ezra Brown
for "Phoebe Floats!"
College Mathematics Journal
March 2005, pp. 114-122.

James Sandefur
for "A Geometric Series from Tennis"
College Mathematics Journal
May 2005, pp. 224-226.

Lester R. Ford Award

For articles published in *The American Mathematical Monthly.*

Joel M. Cohen

Ibtesam Bajunaid, Joel M. Cohen, Flavia Colonna, and David Singman
for "Function Series, Catalan Numbers, and Random Walks on Trees"
The American Mathematical Monthly
November 2005, pp. 765-785.

William Dunham
for "Touring the Calculus Gallery"
The American Mathematical Monthly
January 2005, pp. 1-19.

Edward B. Burger
for "A Tail of Two Palindromes"
The American Mathematical Monthly
April 2005, pp. 311-321.

Karl Dilcher and Kenneth B. Stolarsky
for "A Pascal-Type Triangle Characterizing Twin Primes"
The American Mathematical Monthly
October 2005, pp. 673-681.

Viktor Blåsjö
for "The Evolution of the Isoperimetric Problem"
The American Mathematical Monthly
June-July 2005, pp. 526-566.

The Annie and John Selden Prize Education for Research in Undergraduate Mathematics

The Selden Prize honors a researcher who has established a significant record of published research in undergraduate mathematics.

Chris Rasmussen
San Diego
State University

Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member

The Alder Awards honor beginning college or university faculty whose teaching has been extraordinarily successful and whose work is known to have had influence beyond their own classrooms. This years winners are:

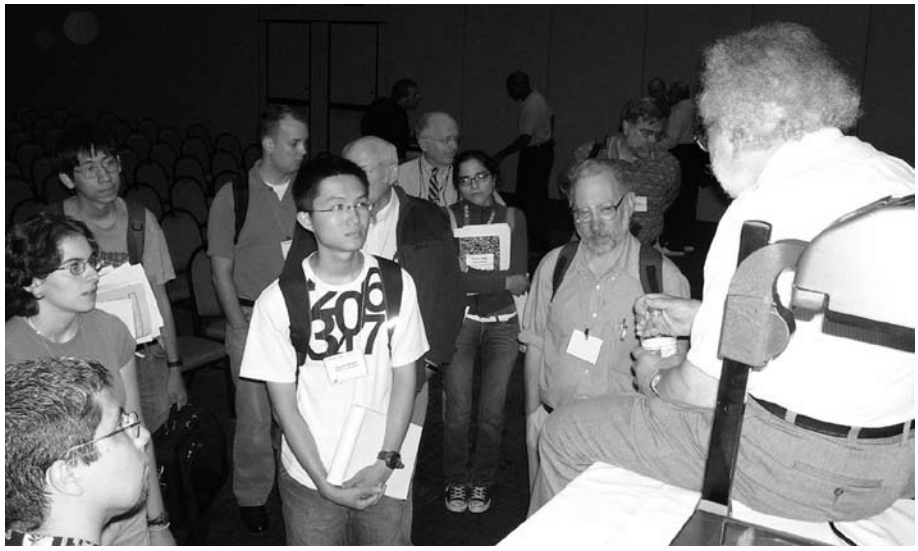
Gerikai (Kai) Campbell of Swarthmore College
Christopher N. Swanson of Ashland University
Lesley Ward of Harvey Mudd College
(Ward was unable to be at the meeting.)

Garikai (Kai) Campbell
Swarthmore College

Christopher N. Swanson
Ashland University

Gödel's Contributions to the Foundations of Mathematics: An Overview

On Friday, August 11, at MathFest 2006, a panel session on "Gödel's Contributions to the Foundation of Mathematics" was presented to commemorate the 100th anniversary of the birth of Kurt Gödel. Attendees were first treated to observations of John Dawson who outlined an overview of the foundations of mathematics before, during and after Gödel. (Due to the unforeseen airline crisis of August 10, Professor Dawson was unable to physically attend MathFest and his remarks were presented by Linda Becerra on the basis of transparencies that he had provided.) Dawson began with the Greek roots of logic, the axiomatic method and various classical paradoxes. He followed with early foundational issues, such as Euclid's parallel postulate, and some of their 19th century resolutions. These latter discussions led to new questions and issues including the recognition of gaps in Euclid and the inadequacy of syllogistic logic.



Informal discussion with Martin Davis after the session.

The overview continued with attempted solutions of these issues touching on Cantor's investigations of Fourier series and his creation of set theory; Hilbert and Peano's development of new axiomatizations for geometry and arithmetic; and Boole's and Frege's contributions. The discussion proceeded with consideration of more recent paradoxes and difficulties, including Russell's paradox, the continuum hypothesis and the controversy over the axiom of choice. Among the responses noted to these matters were Whitehead and Russell's *Principia Mathematica*, Brouwer's intuitionism, Hilbert's formalist program and Zermelo-Frankel set theory. These investigations led to a sharper focus on the ideas of consistency, completeness, decidability and definability in mathematics.

Dawson outlined Gödel's contributions to these considerations including his First Incompleteness Theorem (any system as rich as the arithmetic of the integers is either incomplete or inconsistent); and his Second Incompleteness Theorem (it is not possible to decide the consistency of any system as rich as arithmetic within the system). As for the continuum hypothesis, it was noted that Gödel found it to be consistent with the Zermelo-Frankel axioms while Paul Cohen showed it was independent of those axioms. In his summary, Dawson stated that mathematics is no longer deemed to be in crisis despite the incompleteness theorems. Moreover, though Gödel's name is well-known, few are acquainted with his life and work.

Dawson's observations provided the perfect setting for Martin Davis' address on "Why Mathematicians Should Care about Gödel's Work." Davis opened with a few observations about the significance of Gödel's contributions to mathematics in the 20th century.

> Among *Time* magazine's twenty greatest "scientists and thinkers" of the 20th century, two mathematicians were recognized - Kurt Gödel and Alan Turing, a pair of logicians.
>
> John von Neumann observed that Gödel's "achievement… is singular and monumental… a landmark which will remain visible far in space and time…"

Davis then briefly outlined the approach of Hilbert in addressing the foundations of mathematics and his development of new axiomatizations of geometry and arithmetic. Davis pointed out some of the criticisms of this program by Brouwer and his intuitionism school, as well as some of Hilbert's criticism of Brouwer's intuitionism program.

Agreeing with Dawson, that there is no longer a feeling that there is a crisis in mathematical foundations, Davis pointed out, with regard to the foundations today, that, as Frege had shown, in order to uncover the logical structure of mathematical propositions, one needs Boole's propositional connectives $\neg, \wedge, \vee,$ and $\supset$ together with the existential and universal quantifiers $\exists$, $\forall$. For deductions, three moves are utilized: remove quantifiers to get them out of the way, manipulate propositional connectives, and finally replace quantifiers. Doing this correctly is fussy, and textbooks on "natural deduction" explain how, but mathematicians just do it intuitively. The great part of contemporary mathematics can be expressed in the language of set theory using just the single symbol $\in$ together with $=$ and the symbols for the operations of logic. Davis provided

Martin Davis holds court, with Klaus Peters in the background.

some examples of axioms written in the language of set theory.

However, it was with the background of Hilbert's program to deal with what was, in the 1920s, still felt to be a crisis that Gödel formulated and proved his incompleteness theorems. Davis outlined some of the implications of these theorems. His discussion concluded with some observations by Gödel of his own work.

> For any formal system of axioms of mathematics (as rich as arithmetic) you can construct a proposition — in fact a proposition of the arithmetic of integers — which is certainly true if the given system (call it S) is free from contradictions but cannot be proved in the given system. Now… it turns out that…. this proposition becomes a provable theorem if you add to S the next higher level and the axioms concerning it. …the construction of higher and higher types… is necessary for proving theorems even of a relatively simple structure.
>
> [We have] not yet learned to make use of the set-theoretical axioms (for) number-theoretical problems, except for the axioms of the first level… in analytic number theory. (But) some kind of set-theoretical number theory, still to be discovered, would certainly reach much further. (Gödel's 1951 Gibbs Lecture)

Klaus Peters followed with some remarks by Sol Feferman in memory of Torkel Franzén, a leading authority on Gödel and author of *Gödel's Theorem: An Incomplete Guide to its Use and Abuse*. Professor Franzén had expressed a desire to take part in this panel session, before his untimely death.

Peters also provided remarks on "Gödel and Publishing." He communicated some interesting anecdotes about Gödel and exhibited slides of original correspondence between Gödel and his publishers, which were provided by John Dawson. Gödel was very precise in his instructions and the manner in which he wished his work to be presented in print. Peters told about a few interesting situations in which Gödel and his publishers had disagreements over financial arrangements. It is to be noted that A.K. Peters has published a number of Gödel related books, including the authoritative scientific biography *Logical Dilemmas: The Life and Work of Kurt Gödel* by John Dawson and *Gödel's Theorems: An Incomplete Guide to Their Use and Abuse* by Torkel Franzén.

The organizers of this session would like to express their heartfelt thanks to Professors Dawson and Davis for their interesting and enlightening contributions. Klaus Peters, in addition to his equally interesting and fascinating presentations, was instrumental in helping us to organize, develop and present the session. Acknowledgement is also made to the Special Interest Group on the History of Mathematics who co-sponsored the session. Many thanks to them all and to the audience, especially to those who engaged in lively dialogue with Professor Davis at the end of the session.

Ronald Barnes and Linda Becerra are professors at the University of Houston-Downtown and organized the session on Gödel. For additional discussion, comments or observations, they can be contacted at barnes@dt.uh.edu or becerral@uhd.edu.

Correction

In the October 2006 issue of FOCUS the student chapter advisor breakfast was listed as the Joint PME and MAA Student Chapter Advisors'Breakfast. This is only the MAA Student Chapter Advisor's Breakfast which will be held on Sunday, January 7, 2007 from 7:00 am to 8:00 am.

Richard Anderson is the Newest Member of the Icosahedron Society

Richard D. Anderson, 39th president and a 66 year member of the Mathematical Association of America, was inducted into the Icosahedron Society at the Silver and Gold Banquet during this year's MathFest. Twin brother, John, and sister, Dottie (also a twin) from Chattanooga, joined the attendees of the banquet in celebrating Anderson's generosity to the MAA.

Anderson received his undergraduate degree in 1941 from the University of Minnesota and then studied under R.L. Moore at the University of Texas. After serving four years in the U.S. Navy, he taught at the University of Pennsylvania for eight years, two of which were spent at the Institute of Advanced Study, where he met Einstein and the first three winners of the Abel Prize. Between 1956 and 1980, Dick was professor of mathematics at Louisiana State University in Baton Rouge, where he is now Boyd Professor Emeritus.

The Icosahedron Society was formed in 2000 to recognize individuals who have made significant contributions to the Association. Donations of this type are extraordinary and make it possible for the MAA to continue to promote its mission: to advance the mathematical sciences, especially at the collegiate level.

For further information about contributing to the MAA or about the Icosahedron Society, contact Lisa R. Kolbe, MAA Development Manager, at 202-293-1170 or by email at lkolbe@maa.org.

Carl Cowen and Richard Anderson

Carl Cowen, Richard Anderson with sister Dottie Antman, twin brother John and sister-in-law, Norma.

Members of the Icosahedron Society

Year 2000
Henry L. Alder
Edith Ross and Edward Brinn
Deborah Tepper Haimo
Mary Alice and Marvin Schaefer

Year 2001
Akamai Foundation
ExxonMobil Foundation
Microsoft Corporation
Andrew Sterrett, Jr.

Year 2002
James W. Daniel and
Ann Trump Daniel

Year 2003
Paul and Virginia Halmos
Mary P. Dolciani Halloran Foundation

Year 2006
Robert P. Balles
Tensor Foundation
Richard D. Anderson

Curve Sketching: A Disappearing Delight

By Satish C. Bhatnagar

The graphing of functions is the acme of differential calculus. It brings all the concepts of differentiation together in a symphony: local/global extrema, increasing/decreasing, concavity/convexity, critical and inflection points of a function. Some precalculus concepts like asymptotes, intercepts, and domain and range of a function get refined with the power of limits. Sketching the graph of a function is like shopping in a Wal-Mart Super Center where in one place, we can buy any thing and any service!

Yesterday was the middle of the third week, and also the middle of the 5-week summer session. After analyzing other aspects of the function $f(x) = \ln(x^4 + 27)$, I said, "Let us now sketch its graph." Hardly had I finished saying it when a few students were looking at the graph on their graphing calculators, which are getting 'smarter' as they get less expensive.

I never forbade the use of calculators. By choosing the right problems and rephrasing the questions, it was possible to out-smart the calculators. Students thus saw how the power of calculators supplemented the understanding of mathematical concepts. There was now a feeling of inadequacy about sketching the graphs of 'normal' functions. While I was going through the motion of 10-points, the students followed it through their calculators. When it comes to graphing, both inside and outside the class, my patience too has worn thin.

These thoughts propelled me to my college years, 1955–59. Forget calculators; even the *paper* for doing math problems was expensive. However, in a seamless academic year (no semesters or quarters), those ten points had all the time to get embedded in our minds. The joy of understanding as the graph revealed its shape in bits and pieces was like watching a striptease dancer. The limiting behavior of $f(x)$ and $f'(x)$ gave thrilling moments. Often, the final product was beyond any initial guess about what the graph would look like.

'You've come a long way, baby!' For the last couple of years the time spent on curve sketching has been diminishing. Now more time is spent on the evergreen related rate and optimization problems. Also, more students are coming from biology and biochemistry. Calculus is no longer the monopoly of math and engineering majors. During the last four offerings, my section (out of 8 sections) Elementary Calculus I (MATH 181) did not have even a single math major. This session has only 3 from engineering. The remaining 17 are from other disciplines including two from nursing and one from history!

Nevertheless, this is a sign of mathematical progress. Concepts are prematurely born and buried. In atomic structure (chemistry), I was taught the notion of valence; that no longer exists in textbooks! Modes of transportation, designs of homes and even life values change in a span of 50 years. Yet, there are some fixed points of a function and life in general. The calculus concepts of limit, continuity, differentiation and integration will live forever.

Satish C. Bhatnagar of the University of Nevada in Las Vegas regularly shares his mathematical reflections with an email mailing list. This article is a modified form of his reflection dated June 22, 2006.

AAAS Seeks Nominees for its latest edition of "Resource Directory of Scientists with Disabilities"

The American Association for the Advancement of Science—the world's largest general scientific organization—wants to update its "Resource Directory of Scientists with Disabilities," which it first published in 1978.

This publication will highlight the professional acomplishments and achievements of America's disabled scientists and engineers. "It is important," says Virginia Stern, director of the AAAS Project on Science, Technology and Disability, "to accurately describe the needs of the disability community in order to develop support strategies, new assistive technologies, and improved curricula."

The AAAS hopes that the latest compendium will become a widely used source of information for individuals, the media, writers, community groups, government agencies, etc.

Scientists, mathematicians, engineers, and others in technology are invited to submit their names for inclusion in the directory, which the National Science Foundation is funding.

Interested individuals are invited to contact Tesa Leon (tleon@aaas.org; 202-326-6582) for information.

2006 — The Year of the Dog
An Auspicious Time for the MAA's Study Tour to China

By Lisa Kolbe

For two weeks in June, nineteen MAA members embarked on a journey that highlighted the cultural gems and world renowned sites of China. The tour included talks at universities and personal tours of science museums across China. The weather was most cooperative, our flying within China seamless and on schedule, the people charming and hospitable, and the food a gastronomically exciting experience.

The tour began with a talk, "Traditional Chinese Mathematics up to the Tenth Century," given at the Institute for the History of Natural Sciences in the Chinese Academy, followed by a guided tour of the Forbidden City. The Imperial Observatory of Beijing, made by the Jesuit missionary Ferdinand Verbiest in 1670, was a favorite among the travelers, particularly Helmer Aslaksen of the National University of Singapore. An expert on cultural astronomy, Aslaksen, gave the group a extemporaneous lesson on heavenly mathematics.

The mathematics department of the Inner Mongolian Normal University in Hohhut hosted the MAA Group at an elegant luncheon celebrating our academic camaraderie. This followed two days of lectures, one of which was given by Distinguished Professor Li Di, who recently celebrated his 80th birthday and was Yibao Xu's thesis advisor. Xu, currently professor of mathematics at the Borough of Manhattan Community College, was responsible for the planning and organization of the academic component of this tour. The group was treated similarly throughout the journey.

The Great Wall, the Terra Cotta Warriors excavation site near Xi'an, the canals of Suzhou with its famous silk factory, cosmopolitan Shanghai, and bustling Hong Kong: these were among the enchanting sites that were enjoyed by the participants of the MAA Study Tour. Three members of the group have given brief reviews of their travel to China. If you should have any questions about these Study Tours, please contact Lisa Kolbe, Development Manager, at lkolbe@maa.org or 202-293-1170.

The tour group at the Great Wall. Front Row: Shirley Cropper, Carol Dotseth, Ruth Ross, Linda Haack, Ken Ross, Tina Straley, Brad Chin, Inez Hollander. Back Row: John Wilkins, Gregory Dotseth, Lisa Kolbe, Jessica Straley, Jennifer Perkins, Helmer Aslaksen, Beth Bennett, Ron Rosier, Jeff Bennett, Joel Haack

Brad Chin
West Valley College, Saratoga, CA

The reviews of previous MAA Study Tours established my expectation that the tour of China would address general interests. I thoroughly enjoyed the sightseeing, entertainment, culinary, and shopping highlights in each city. Among my favorites in each category were the Great Wall near Beijing, the acrobats in Shanghai, dumplings in Xi'an, and the silk factory in Suzhou.

Unique to the MAA tour were visits arranged by the tour historian, Yibao Xu, to universities and science institutes. These visits were significant for the MAA delegation and for our hosts. Our delegation learned about Chinese achievements in math and science through lectures and displays. I also spoke with friendly faculty and students about math and education. A fifth-generation-American of Chinese descent, I gained an appreciation for the Chinese people and their accomplishments. Our hosts received us as honored guests and showed us the highlights of their facilities. In fact, a lecture on the exchange of mathematicians between China and the United States included in our visit among the momentous events.

Brad Chin at the Terra Cotta Warriors Excavation Site in Xi'an.

The study tour was a momentous event for me as well. It facilitated my introduction to a country in which I had little previous interest but to which I envision returning. It expanded my knowledge and interest in the history of mathematics. In addition, I enjoyed talking with local people and fellow travelers. This year's experience makes next year's Euler tour even more attractive.

Jennifer Perkins
Atlantic Highlands, NJ

Traveling to China was my first jaunt outside North America. Traveling with a group of fun loving mathematicians made it all the more special as my trepidations about traveling with strangers were assuaged once I got to know everyone. I loved the itinerary, traveling to Beijing, Hohot, Xian, Shanghai, and Hong Kong, places one only reads about.

Each city was unique in its history, customs, and socioeconomics and I enjoyed learning about them from our knowledgeable local tour guides. Shanghai was by far the most exciting city with its futuristic skyscrapers and bustling economic activity and I loved dining at M on the Bund and viewing the Shanghai skyline. Xi'an had a certain elegance about it that was clearly noticeable. The architecture of its buildings, ancient and modern, displayed the influence of the Tang Dynasty, considered to be the golden age of Chinese history.

Jennifer Perkins at Victoria Peak, Hong Kong.

I enjoyed visiting the Chinese institutions of higher learning and science academies and listening to the lectures of its professors. The tour of the campuses and libraries were great, especially when I toured the home of a professor from Inner Mongolia Normal University and found that some of the volumes that adorned the shelves of his private library were identical to some of the volumes that adorned the shelves of mine. As an amateur mathematician, it did my heart good to see this.

Another exciting aspect of this journey was sampling new cuisine. One memora-

ble meal occurred at a roadside restaurant en route to the Great Wall which served delicious barbecued lamb and fish. Seeing the Great Wall was breathtaking as well as the steep walk to reach it, so not only did I have a fantastic time viewing other landmark sites like the Forbidden City and the Temple of Heaven, but I got a great workout as well.

Ron Rosier
Director of CBMS

Traveling with math people is fun — at least, traveling with those math people who go on the MAA study tours has been great fun. I have been on all four tours and the locations have been very appealing — Greece, England, Mayan Mexico, and China — but it is the people that have made the trips exciting. In addition to being bright and curious, math people are full of arcane knowledge. On these trips, it seems that for every attraction, and particularly every mathematical attraction, there is someone in the group who has taught or written about it and who can add to what the books and the local guides have to say. An old astronomical instrument at the Beijing observatory comes alive when one of your colleagues jumps inside it and enthusiastically shows how it works and explains why it was so important in its day. Have a question about that strange bird you just saw or that new electronic gadget in a shop, chances are good someone just read about it or has had a lifelong interest in studying just those things.

Besides being adventurous in exploring new places, most of the travelers have also been adventurous eaters, and some of my favorite memories involve eating and drinking local delicacies with new friends in exotic settings. "Sheep's guts" (so identified on the buffet sign) as a breakfast dish in Inner Mongolia was perhaps pushing the limit, but those who tried it found it surprisingly tasty. I look forward to joining old friends, making new ones, and learning much from all of them, on the Euler tour next summer.

Tina Straley and Yibao Xu (with badge) with the director of the Chinese Museum of Science and Technolgy on left.

Ron Rosier with statue of Mao Zedong, East China Normal University, Shanghai.

Tour members at the Chinese Museum of Science and Technology in Beijing.

Director of Publications for Journals and Communications

The Mathematical Association of America seeks a highly qualified person for the position of Director of Publications for Journals and Communications. The primary responsibilities of the position are to oversee journals and other periodicals and content and resources on the MAA website. In addition, the Director will perform other duties related to communications of the MAA to our members, the public, and other specific constituencies.

A candidate should have a PhD in the mathematical sciences. Requirements include editorial experience, writing articles for journals, periodicals, and the web, and experience with creating web content. The candidate should be familiar with the MAA, have a strong interest in writing and publication, and express a vision for MAA publications in print and online.

The Director oversees publication of the Association's three journals, three magazines (two online), the Association's newsmagazine, a variety of columns and articles, the MAA Mathematical Sciences Digital Library (MathDL) and the new MAA Gateway site to other digital libraries. In addition, the Director will oversee mathematical and professional resources on the MAA website and will develop content for new resources to serve our members and the public. The Director will be responsible for communications of the MAA such as reports, news articles, and public awareness pieces.

The Director will oversee a staff of three located in the headquarters office and numerous editors and editorial boards. Duties include administration of the department and grant proposal development and management. The Director reports to the Executive Director and is a key member of the MAA's staff leadership team. S/he will work closely with other members of the staff, national and sectional officers, committees and editors, and others in strategic planning and program development.

The mission of the MAA is to advance the mathematical sciences. The MAA, with nearly 30,000 members, is the largest association in the world with a focus on mathematics accessible at the undergraduate level. Membership includes college and university faculty and students, high school teachers, individuals from business, industry, and government, and others who enjoy mathematics.

The Director is responsible for ensuring that publications encompass the interests of all major constituencies of the MAA, embrace all areas of mathematics, and are easily available to all of our members and the larger community who are interested in mathematics, especially for expository mathematics and materials for faculty and students.

Applications will be accepted and reviewed as received, but it is expected that the position will begin between January 1, 2007 and July 2007. The position is located at the national headquarters of the MAA in Washington, DC. Candidates should send a resume and letter of interest to:

Ms. Calluna Euving
Chief of Staff
Mathematical Association of America
1529 18th Street, NW
Washington, DC 20036

Applications may be submitted electronically to ceuving@maa.org. References will be requested after review of applications. Applications from individuals from underrepresented groups are encouraged. Additional information about the MAA and its programs and services may be found on MAA's website: http://www.maa.org. AA/EOE.

IRS Regulation Regarding MAA Dues

Current IRS regulations do not allow the payment of professional dues to be taken as a charitable contribution for individual taxpayers but may still be deducted as business expenses. The 2007 dues notices still indicate that a proportion of your dues may be deducted as a charitable contribution to the MAA. This is no longer the case. Any added dues in the VDS (Voluntary Dues Supplement) or charitable contribution that you add to your payment, or donate at any other time, are fully tax deductible as charitable contributions.

We regret any inconvenience that this corrected interpretation of the relevant IRS code may cause. This statement supercedes any printed statement regarding the deductability of a portion of your dues as a charitable contribution that may be printed on your 2006 or 2007 dues invoice.

If you have further questions, Sharon Tryon, the Director of Finance, can answer general questions at 202 319-8485, or via email at stryon@maa.org. The MAA cannot be responsible for giving specific tax advice.

Letters to the Editor

Thank You

I taught high school and college mathematics for 40 years, and was a member of the NCTM and MAA for nearly the whole time. I retired in 1999, and at that time, let my memberships lapse to save some money.

I just received the latest issue of *FOCUS*. It is excellent. The articles are well written, interesting, and informative. I especially enjoyed the article by Jeff Suzuki about Open Source Software — the kind of software that I can afford!

Please keep up the great work—and maybe even suggest that FOCUS become a monthly publication! I really appreciate the MAA keeping me informed.

Allen Holmes

We aims to please! Alas, if FOCUS was monthly, the editor would go nuts. But letters like this one do help us keep going.

More on Open-Source Software

The article, "The open source revolution," on available open-source mathematics software by Jeff Suzuki [Aug/Sep 2006, pp. 26 –27] was very informative. More of us need to know about the availability of such software for use in our classes and for our own use. However, Suzuki mentioned only CAS and DGS and missed mentioning another important category of math software: numerical computation software (NCS) that is particularly suitable for linear algebra and is much used by mathematicians and engineers.

The most popular commercial NCS is Matlab. Two notable open-source NCS are Scilab and Octave, which can be found at http://www.scilab.org/ and http://www.gnu.org/software/octave/.

It is becoming more common for textbooks to include code or exercises for exploration with software. However, most of it has been specific to the "big three": Mathematica, Maple, or Matlab. I hope that authors will begin to see value in including the more popular open-source software like Maxima and Octave as well.

John B. Thoo
Yuba College

Calculators and Cyborgs

I taught electrical engineering in an ABET accredited college for several years, teaching a number of courses for which calculus is the prerequisite. I noticed early on that students relied heavily on the TI-89 to do simple math, solve algebra problems, and integrate. Often the solution development that appeared on the page would take a giant leap forward by virtue of some obscure symbolic manipulation on the calculator. I decided to allow this, provided that the student wrote down the keystrokes so that I could duplicate the result.

A few years ago NCEES decided to ban the TI-89 from their exams for various security reasons. They administer the Fundamentals of Engineering exam that many colleges and universities use as an assessment tool for their engineering programs. Now students would have to perform on the FE exam all of the math, algebra, and calculus that the TI-89 had previously done for them using only a scientific calculator, pencil, and paper. I thought that it would be prudent to teach them how to do this, and so I banned the TI-89 from my exams.

I found that some very bright students who had shown great skill with the TI-89 were unable to successfully bias a JFET without it. This requires the student to find the solution to a linear and a quadratic equation using only a scientific calculator. What these students lacked was pencil and paper skills. They misused the equal sign, couldn't read their own writing, tried to do too much in their heads, and failed to organize their work so that they could follow it. I also found that their algebra and math skills would often desert them. It is as if the students have become cyborgs — algebra and math resides in the TI-89, not in their heads.

This is what I've encountered in my little corner of the midwest. I went through college using a slide rule and didn't familiarize myself with the TI-89 until I started teaching, so maybe my view of students as cyborgs is hyperbole, but I'd be interested to see what happens to the math skills of students if the SAT should ever ban the TI-89. I'm looking forward to it.

Rich Kenefic
Ft. Wayne, IN

Getting Students to Attend Colloquia

In the Letters to the Editor section of the August/September 2006 issue of FOCUS, Peter Ross of Santa Clara University asked about schools that have offered credit for attending colloquia. The University of Minnesota Duluth has had such a course for nearly 30 years. This course is one credit pass/fail and is required for all mathematics and math education majors. Students satisfy the requirement by attending biweekly colloquia arranged specifically for them. To insure accessibility, the speakers assume only sophomore level math courses as background. Although the majority of the talks are given by UMD faculty we occasionally have graduate or undergraduate students give presentations on research projects that they have done. The most popular talks are those given by speakers from business or industry (usually former UMD math majors) who tell how they use math in their jobs, how they got their jobs, what kind of projects they work on, what advice they have to give, what salary new math graduates can expect, etc.

Each student must earn 16 points to get credit for the course. Each colloquium attended is worth one point (there is a sign up sheet at the talk). For each satisfactory written report a student receives one point. At least four of the 16 points must be earned by writing. The student decides

which colloquia to attend and which to write reports on. This flexibility results in greater interest and better written reports. Students can earn extra points by presenting a colloquium. Although most students enroll in the course in their last semester, they accumulate points over several semesters. We keep track of the points as they are earned.

The purpose of the course is three-fold. We want to expose students to mathematical ideas different than those they learn in their courses. We want students to be able to listen to a math presentation and be able write a well written report on the presentation. This improves their communication skills. And we want students to hear about the kinds of jobs and work that UMD math graduates are doing.

The faculty member in charge of the course arranges the colloquia and grades the reports. For teaching load purposes, handling the one credit course for both semesters counts the same as one three credit course per year.

The course is quite popular among students and faculty. Many students earn more than the required 16 points even though the course is pass/fail. In exit questionnaires given to seniors the course is often cited as one of the most liked. The colloquia are open to the public and occasionally attract a broad audience. The keys to success are the accessibility of the talks and the opportunity to hear recent graduates tell about how they use their math training in their jobs.

Joe Gallian
University of Minnesota Duluth

More on African-American PhDs

The article "University of Mississippi Graduates Record Number of African-American PhDs" in August/September issue of FOCUS by Dr. Tristan Denley presents some very good news. It is wonderful that historically white institutions like the University of Mississippi and the University of Maryland at College Park are graduating significant numbers of black mathematicians. The article correctly points out that the number of black PhD's in mathematics remains very low.

However, the quote from Don Cole, "What happened on May 13 in Oxford was an historic milestone, unprecedented in the United States, with only the University of Maryland coming close" is significantly misleading. Since 2000 Howard University has granted 17 PhDs in mathematics. Of these, twelve were granted to black Americans (including seven females, also an underrepresented group among mathematicians) and four to black Africans. And, while the four "at one commencement" is indeed a record, Howard University granted four mathematics PhDs in 2001 (one of whom finished in the summer) all to black Americans.

Abdul-Aziz Yakubu
Howard University

The Beauty of the University System in the United States.

The list of the 2006 Award Winners for Distinguished Teaching highlights one of the strengths of the university system in this country. College students in the U.S. can have access to outstanding mathematics instructors in all sorts of institutions of higher education, ranging from small to very large, public or private, research oriented or focused on teaching. Some are in big urban areas, others in small communities. Some of the distinguished teachers teach at institutions that are well known throughout the world. Others teach at institutions that focus on serving the needs of a local population. The great instructors also come in all kinds. They can be at very different points of their careers, ranging from some who will retire soon to others who are in the process of obtaining their doctoral degree. Some are also outstanding researchers, or have attained national recognition through their publications. Others are mainly devoted to their own students and are little known outside their own institutions. The list illustrates that our students have the opportunity to have access to outstanding mathematics instructors across the country. That is not common in other countries; in many, the best instructors are located in just a few institutions in the main cities.

Alfinio Flores
Arizona State University

Getting Poincaré Right

In the statement of the Poincaré Conjecture in your excellent FOCUS article, the phrase "compact three-dimensional manifold" should read "compact, connected three-dimensional manifold". Otherwise, the disjoint union of two copies of S^3 would be a counterexample.

A Blogger Follows the National Mathematics Panel

An anonymous blogger has begun to follow the meetings and activities of the National Mathematics Panel (about which see the articles in our May/June and August/September issues). The blog, located at http://mathpanelwatch.blogspot.com, calls itself Math Panel Watch. It is updated only occasionally, but tries to include information on what the panel has been doing and will be doing.

The tone of the blog is mostly critical. As in most blogs of this kind, the contributors seem awfully proud of what they are doing; one posting, for example, is entitled "If They Won't Share It, We Will." All that is being shared, alas, is the schedule for one of the meetings. Nevertheless, the site gives some useful insider information on the workings of the panel and may be of interest to those who want to know what's going on.

The official site of the National Mathematics Panel is at http://www.ed.gov/about/bdscomm/list/mathpanel/index.html.

William F. Lucas Fund Presents a Short Course at MathFest

Shown at MathFest are: Tina Straley and Martha Siegel in front, and in the back are: John Maceli, Carl Cowen, Bill Lucas' brother Charles and nephew Bill.

The MathFest Short Course this August in Knoxville was the first short course presented in the honor of William F. Lucas. In January 2006 friends, colleagues and family of Bill Lucas formed the William F. Lucas Fund. The purpose of this fund is to help supplement the cost of putting on the short course given by the MAA at the summer MathFest. Although Bill was unable to attend for health reasons, he was represented at the course by one of his brothers and a nephew. The topic of this summer's short course, Environmental Modeling, was a fitting one to honor Bill, as he was a pioneer modeler in many ways.

Bill was trained as a game theorist and had an outstanding career at Cornell University and Claremont Graduate School. His graduate students have made major contributions both as researchers and teachers. Although Bill is perhaps best known for his work in game theory and in particular for his "counterexample" in the paper "A Game with No Solution" published in the *Bulletin of the AMS* (1968), he had a major impact in the education of mathematics students and faculty. In particular, he was actively involved in MAA editorial positions and served as chairman of CUPM. He also gave numerous minicourses and workshops across the country. Many of these courses dealt with non-standard topics (which have now become standard in many programs—mainly due to Bill's influence) such as voting theory, apportionment, fairness and equity and mathematics applied to the social sciences.

Members interested in helping support the continuation of the MathFest Short Course and honoring Bill Lucas may contribute to the William F. Lucas Fund by contacting the MAA.

PMET Returns to Texas Southern University

By Jacqueline Brannon Giles

"Don't mess with Texas" is a slogan that gets your attention. It communicates that if something is good, you don't interrupt its flow. The MAA's Preparing Mathematicians to Educate Teachers (PMET) programs are imparting attitudes, creative content and teaching strategies to mathematicians. This type of focus is needed in mathematics classes across the nation, especially in culturally diverse academic environments.

Texas Southern University's PMET 2, coordinated by Joan Evans and Kathy Ivey, focused on its mission of preparing mathematicians to educate teachers. It was held July 30 to August 5, 2006, in Houston, Texas.

The opening ceremony was held at the elegant University of Houston Hilton Hotel, with greetings from Dr. Victor Obot, TSU's Associate Dean of Science and Technology. The seven-day workshop was a follow-up to the 2005 workshop, coordinated by Evans and Ivey. TSU's mathematics department, chaired by Dr. Nate Dean, was the venue for most of the activities. The workshop served as one of the culminating activities of the mathematics department in the historic Samuel S. Nabrit Science Center. When the workshop ended, TSU's mathematics department prepared to move to its new home in a beautiful science building.

The participants found many of the curricular activities selected by the presenters quite challenging. Even mathematics professors have to think hard about certain types of problems, one participant observed.

The list of participants included Timor Sever, Wade Ellis, Irvin Vance, Charles Peters, and Garret Etgen. The typical day at the workshop included lab classes, discussion of lab classes with students and participants, led by co-director Evans and Ivey, guest speakers, discussion, reflections and fun time activities.

As a participant and observer it was so much fun to see research mathematicians like Dr. Willie Taylor, Associate Director of TSU LSAMP (Louis Stokes Alliance for Minority Participation), for example, twist his eyebrow and come up with a plan to solve problems. I tried to contribute, and kept saying, "This is not my favorite type of mathematics." It made us admit that it is important to do some mathematics very well, but you certainly don't have to be outstanding in all mathematics. Humility was a lesson for all of us to learn. Clearly many scenarios from real life are more like puzzles rather than deterministic models that so many try to set up when they do mathematics.

The activities from websudoku.com are a good example. The instructions from the presenter and the website read: Each sudoku puzzle has a unique solution that can be reached logically without guessing. Enter digits from 1 to 9 into the blank spaces. Every row must contain one of each digit. So must every column, as must every 3x3 square.

Students, too, got involved and displayed various behaviors as they sought to find solutions. Instructors and professors stood around the tables of students. They had to hold back their temptation to point, and hint at approaches to solve the puzzles and problems. One student frankly shared her feeling that a couple of the professors got too involved. The student affirmed that she was interrupted and just needed time to think without a professor giving nonverbal cues.

PMET co-directors Joan Evans and Kathy Ivey were a great team, and the result was a very successful program.

Jacqueline Brannon Giles is a member of the FOCUS editorial board.

Aaron Ansley and Jessica Poole, TSU Students.

PMET Participant with Kathy Ivey, co-director; Timor Sever in background.

A Report on the Mathematics Genealogy Project

By Fred Worth

Presumably anyone with a doctorate in mathematics knows the identity of his or her dissertation advisor. But do you know the identity of your advisor's advisor? That is the question that served as an inspiration to Harry B. Coonce, founder and director of the Mathematics Genealogy Project. Dr. Coonce elaborates:

"In the early days circa 1995 I was pondering who my advisor's advisor was. Upon a little investigation I determined that no general set of records seemed to exist. Yes, I knew blackboards and bulletin boards all over academia had charts of personal data. Sensing there was no comprehensive record I considered making one. Upon discussing this idea with my wife (a professor of computer science) she said that perhaps she could write a program to expedite this project."

Coonce decided to see what he could find in the area of support for this project.

"While musing on this I attended the Institute for Using History in the Teaching of Mathematics in the summer of 1995. I floated the idea to some of the people there. The reaction was almost uniformly negative: It wouldn't be history nor would it be mathematics." (Dr. Coonce reports that most critics have subsequently changed their minds.)

The beginnings of the project used a program that he had which was designed to write "Adventure" games. Fortunately, it was around 1995 to 1996 and Coonce soon became aware of the World Wide Web. "Somebody had written the program that I wanted," he said. "I started learning HTML and soon realized I needed a geek. The first one I had was Neil Young. What a brilliant young man! He set up the basic format. In the meantime I sent out letters to all the departments of mathematics in the U.S. that had PhD programs asking for data." The data which Coonce sought were the names of mathematicians with doctorates, the university at which the degree was earned, dissertation titles, the year the degree was earned and the advisor's name

Coonce continued, "In 1997 I went to the Joint Mathematics Meetings in San Diego and presented a 'paper' about the project. Well, one person who was very interested and encouraging was Saunders Mac Lane. Saunders Mac Lane! I was euphoric."

By late 1997, enough data had been accumulated to begin. In October 1997 the first set of names was posted on the web. The project began with about 3500 partial records.

Funding became a bit of an issue since Coonce was paying students who were helping him. He applied for a small grant to try to ease the burden of paying them paid out of his own pocket. Coonce reports that the grant application was rejected. "I had not cited any similar projects. This research was rejected because it had never been done."

By the spring of 1999, the project had reached about 25,000 records. Coonce decided to retire from teaching at Mankato State and devote his time to the project. After some initial reluctance, Mankato provided him with an office and he got to work.

By the summer of 2002, the project was up to about 50,000 records and had established a mirror site in Bielefeld, Germany. Unfortunately there was a setback. Mankato was no longer going to provide office space. "They saw no academic value in the project," Coonce said.

Friends at North Dakota State University came to the rescue. According to Coonce, "They said I could come there. They just didn't have any money or space. How could I refuse such a generous offer? So, I bought a new computer and set it up in a closet in Fargo."

Soon Coonce found more support.

"At the Joint Math Meetings in Baltimore in 2003, I approached John Ewing about support from the American Mathematical Society. That was the beginning of their involvement. They give me a little money each year, but their big contributions are things like their mirror, the ad in the Notices and the booth at the Joint Meetings."

At the Atlanta meetings, Steven Krantz stopped by the project booth.

"We chatted and he inquired about my funding. I mentioned the AMS, contributions from various mathematicians and, of course, my checkbook. He offered to help find some funds for the project. He put me in touch with the Clay Mathematics Institute! I received a substantial grant from them."

For anyone with any interest in history, the Mathematics Genealogy Project provides lots of fascinating information. One can find one's genealogy as far back as the data goes. Coonce says "We first sent letters to PhD institutions in the United States. It didn't take long to realize that the chains were taking us back to Europe."

It is also possible to trace forward, finding one's mathematical "siblings."

Coonce continues, "When we were first collecting data some of my friends and I tried to guess what an eventual maximum might be. Guesses ranged from 25,000 to 35,000. No one at that time even suggested something as absurd as 50,000."

More information is still sought. Coonce explains, "Starting out, we sent out letters. Maybe 30% or so were answered. I went to meetings and solicited information and help. Used to check all the obituaries for lists of students. Actually, I still solicit information. I am going to the ICM 2006 in Madrid and give my spiel."

There are several means for people to submit information. "For a few entries, say up to maybe six or eight, they can use the new data form on line (http://genealogy.math.ndsu.nodak.edu/). For larger contributions it is probably easier to send email to me (harry.coonce@ndsu.nodak.edu). Web sites of universities or profes-

sors who have their data on-line are good. Shucks, I even received a dozen names via snail mail last week."

There have been frustrations along the way. One was losing the office space at Mankato. Coonce says. "I know now that was one of the best things for the project in the long run, but, at the time, it was challenging." Finding good help has not been a problem. Keeping it has. "I have had half a dozen good ones who would graduate and then I would have to search for a replacement. This problem ended in 2002 when we moved to NDSU and Mitch Keller joined the project."

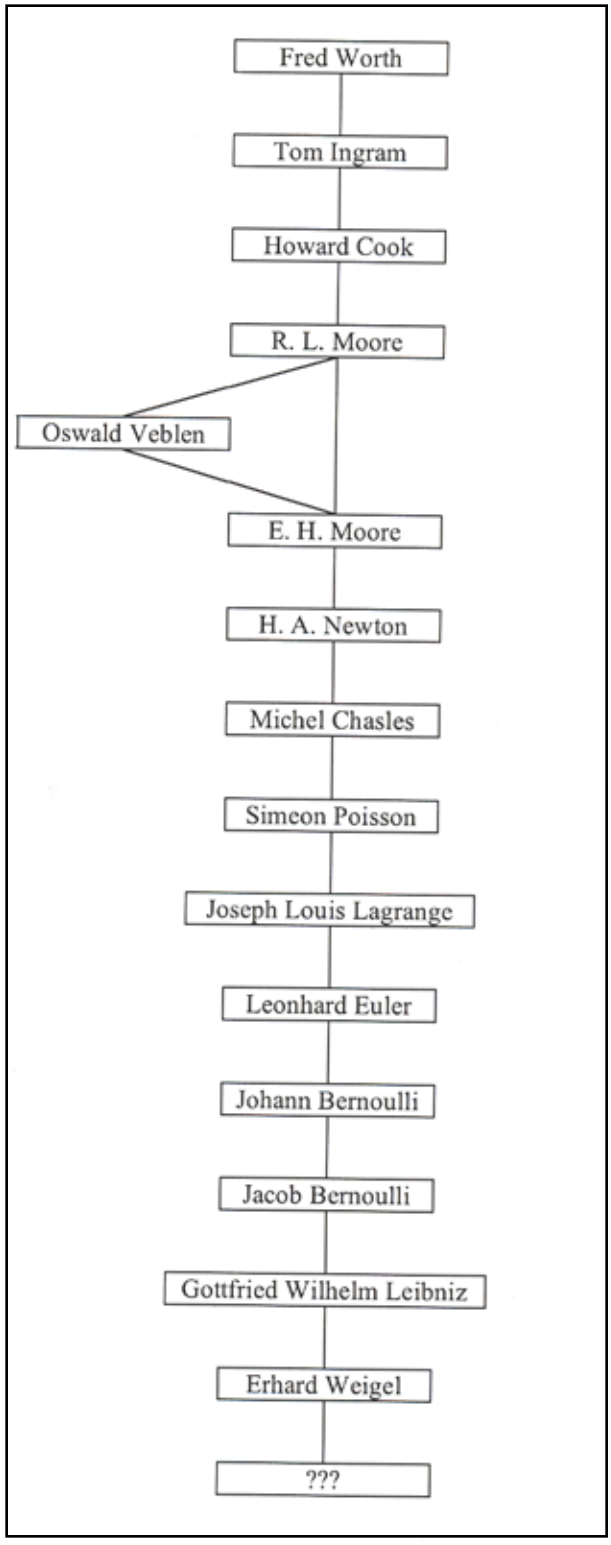
Obviously, the project would not have continued if there had not also been some enjoyments. "There have been many enjoyments. Strangers stopping me at meetings and saying; 'Hi Harry, what's the number now?' Letters of encouragement and thanks."

"But the biggest enjoyment for me continues to be: Wake up in the morning, go downstairs, open my e-mails and put in the new data."

The project has a small commercial side as well. They used to print t-shirts, though that has been discontinued. But for anyone interested, they will make posters of any mathematician's genealogy.

Coonce hopes that all mathematicians who hear about the project will take the time to make sure he has, or eventually receives all information that they can provide.

Fred Worth's Mathematical Genealogy



Call for Proposals

2007 Grants for Women and Mathematics Projects

The MAA plans to award grants for projects designed to encourage college and university women or high school and middle school girls to study mathematics. The Tensor Foundation, working through the MAA, is soliciting college, university and secondary mathematics faculty (in conjunction with college or university faculty) and their departments and institutions to submit proposals. More detailed program information is available through the project website, http://www.maa.org/programs/tensor_solic.html

Submit proposals to:
Dr. Florence Fasanelli
Mathematical Association of America
1529 Eighteenth St NW
Washington, DC 20036

Proposals will be due by February 15, 2007. Please do not hesitate to contact the Program Director for assistance in preparing your proposal. You can reach Dr. Fasanelli at 202.966.5591 or e-mail ffasanelli@juno.com

MAA Regional Undergraduate Mathematics Conferences

The MAA has funding from the Division of Mathematical Sciences at the National Science Foundation to provide support for institutions or groups of institutions that wish to initiate or expand undergraduate mathematics conferences. More detailed program information and application materials are available through the project website, http://www.maa.org/rumc/

We are currently accepting proposals for the conferences scheduled in Spring or Fall 2007. Submit proposals to proposals@maa.org

Grants for Tensor-SUMMA Program: Strengthening Underrepresented Minority Mathematics Achievement

The Tensor Foundation has provided funding for the MAA to award grants for programs designed to encourage pursuit and enjoyment of mathematics among middle school students, high school students, and/or beginning college students from groups traditionally under-represented in the field of mathematics. College and university mathematical sciences faculty and their departments and institutions may submit proposals. They should collaborate with secondary and middle school mathematics faculty as appropriate depending on the focus of the project. More detailed program information is available through the project website, http://www.maa.org/programs/tensor-summa.html

Submit proposals to proposals@maa.org

Deadline for submission is February 15, 2007.

MAA Student Research Program

The MAA and its Strengthening Underrepresented Minority Mathematics Achievement (SUMMA) Program invite mathematical sciences faculty to apply for grants to host an MAA Student Research Program on their own campuses for six weeks in Summer 2007. These grants will support stipends for one faculty researcher and a minimum of four local minority undergraduates, as well as costs for student room and board. The MAA will fund up to 12 grants. Support for the grants is provided by the National Science Foundation, the National Security Agency and The Moody's Foundation. More detailed program information is available through the project website, http://www.maa.org/nreup/.

Submit proposals to proposals@maa.org

The deadline for receipt of proposals is February 21, 2007.

Report Card: College Education is Unaffordable in Most of America

By Harry Waldman

According to the report "Measuring Up 2006: The National Report Card on Higher Education," which the National Center for Public Policy and Higher Education, San Jose, CA, issued on September 6, the nation's colleges and universities have, since the early 1990s, become less affordable for students and their families.

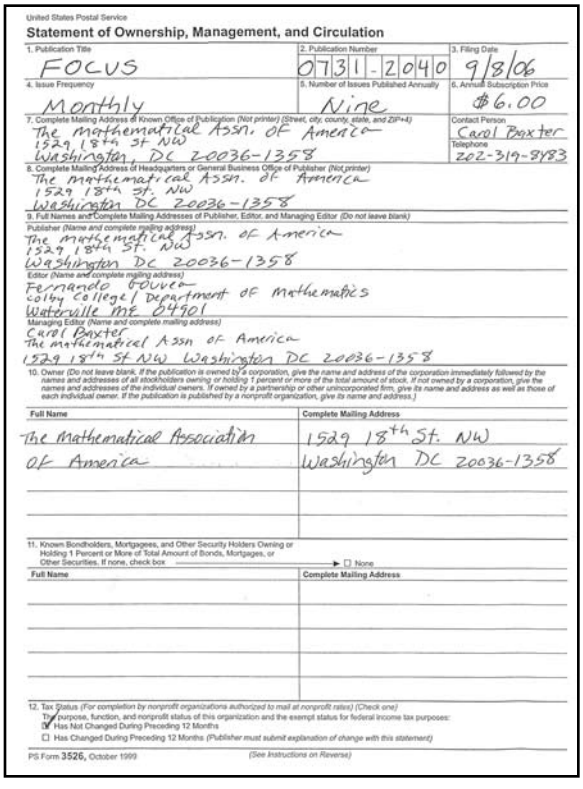
The affordable college education is apparently vanishing from the American scene along with "affordable" health care and "affordable" housing. Only California, Utah, Washington, Idaho, Minnesota, New Jersey, and Hawaii offer less expensive higher educational institutions, alongside need-based financial aid that results in low student debt.

The report, billed by the non-profit organization's president Pat Callan as a "diagnostic" tool to help states "understand their strengths and weaknesses," noted that every state has continued to improve on the extent to which young people are academically prepared for college, although the level of improvement across states is uneven. State improvements in this category are greater than in other categories measured, yet these improvements have not resulted in gains in some important areas, including the percentage of young adults graduating from high school in four years.

Meanwhile, the nation continues to experience disparities in educational performance by race/ethnicity and family income. Most states have made modest gains over the last several years in the proportion of students completing degrees and certificates, with the fastest growth in non-degree certificates awarded.

However, even the best performance among states is not impressive. For instance, in the best-performing states, only 65% of first-year community college students return for their second year, and only 67% of students at four-year institutions complete a bachelor's degree within six years of enrolling. In fact, the United States compares very poorly with other countries in this category, based on international comparisons. There's another bright spot. Since the early 1990s, most states have increased their "educational capital" as measured by the percentage of adult residents with a bachelor's degree or higher. As a result, many states have seen an increase in the economic benefits that accrue from having a highly educated population.

The full report can be found at http://highereducation.org.



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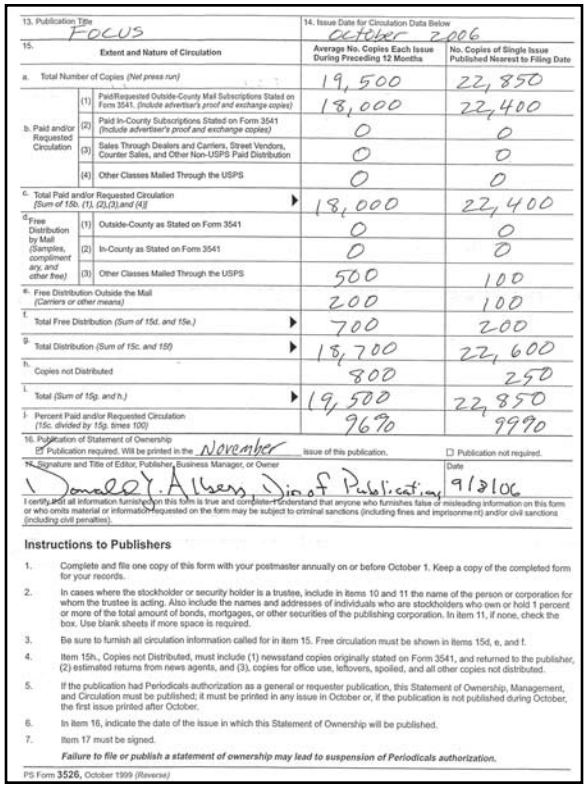

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PS Form 3526, October 1999 (Reverse)

Employment Opportunities

ARIZONA

The University of Arizona
The Mathematics Department at the University of Arizona invites applications for tenure-track positions at the Assistant, Associate or Full Professor levels, to begin Fall of 2007. By the time of appointment, candidates are expected to have a PhD and an excellent research record or potential, as well as a strong commitment to teaching.

There will also be Post-doc positions and/or Visiting positions available.

Please refer to the "Employment" portion of our website at http://math.arizona.edu for additional information, application procedures and deadlines.

GEORGIA

Georgia College & State University
The Department of Mathematics at Georgia College & State University invites applications for a tenure-track position in mathematics and a tenure track position in mathematics education, at the rank of Assistant Professor. A terminal degree is required for each position. Excellence in teaching, scholarly activity, and service are requirements for promotion and tenure. Employment will begin August 1, 2007. GCSU is Georgia's Public Liberal Arts University, with a strong commitment to student-centered education in a residential setting. For more information about these positions and application instructions, see http://www.gcsu.edu/facultyjobs. Review of applications will begin November 27, 2006. GCSU is an Equal Opportunity/Affirmative Action institution.

ILLINOIS

Southern Illinois University Edwardsville
Southern Illinois University Edwardsville, a comprehensive state university 20 miles from downtown St. Louis, Missouri, invites applications for a tenure-track assistant professor beginning August 2007. Applicants should have a Ph.D. in math education, statistics, or mathematics. Review of applications will begin November 15, 2006. For more information, visit www.siue.edy/MATH/.

MAINE

Colby College
The Department of Mathematics at Colby College invites applications for a tenure-track position in mathematics at the assistant professor level, beginning September 1, 2007. Preference will be given to candidates with active research programs in subfields of geometry or topology. Exceptional candidates in other fields will also be considered. Candidates should have a Ph.D. in mathematics and should show promise in both teaching and research. The appointee will be expected to maintain a vigorous research program while also being an exceptional teacher and advisor at the undergraduate level. Teaching load is five courses a year.

Send curriculum vitae, statements on teaching and research, and three letters of recommendation to:

Tenure Track Search Chair
Department of Mathematics
Colby College
5830 Mayflower Hill
Waterville, ME 04901

We cannot accept applications in electronic form. Review of applications will begin on November 15, 2006 and will continue until the position is filled.

Colby is a highly selective liberal arts college located in central Maine. The college is a three-hour drive north of Boston and has easy access to lakes, skiing, the ocean, and other recreational and cultural activities. For more information about the position and the department, visit our web site at www.colby.edu/math.

Colby is an Equal Opportunity/Affirmative Action employer, committed to excellence through diversity, and strongly encourages applications and nominations of persons of color, women, and members of other underrepresented groups. For more information about the College, please visit the Colby Web site at www.colby.edu

MICHIGAN

Michigan Technological University
Department of Mathematical Sciences
Developmental Mathematics Specialist
Candidates are invited to apply for the position of Lecturer and Developmental Mathematics Specialist, starting 20 August 2007. Applicants must have a Master's or Ph.D. degree in the Mathematical Sciences or Mathematics Education. Applicants must have excellent teaching credentials, and preference will be given to candidates who have experience teaching developmental math at the high school or university level.

Duties include overseeing all aspects of the Developmental Mathematics Program and a Quantitative Literacy course; assisting with the training and supervision of teaching assistant, and teaching developmental mathematics and more advanced courses, such as Calculus. The teaching load is three courses per semester.

Interested candidates should send a vitae, a description of teaching methods and objectives, and three letters of recommendation to: Search Committee, Developmental Mathematics Specialist, Department of Mathematical Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295. Review of applications will begin 1 February 2007 and continue until the position is filled.

Michigan Technological University is an Equal Opportunity Educational Institution/ Equal Opportunity Employer/Affirmative Action Employer.

Michigan Technological University
Department of Mathematical Sciences
Director of First-Year Mathematics
Applications are invited for the position of Lecturer and Director of First-Year Mathematics, starting 20 August 2007. This individual directs the First-Year Mathematics Program as well as the MaCH-I summer program for incoming first-year students. The Lecturer position is a nine-month appointment, and the Director receives an additional two months of summer salary for directing MaCH-I.

Duties for this position include shared responsibility for all first-year courses, placement and retention of students in mathematics courses, training and supervision of teaching assistants, development of summer programs, and teaching at the first-year level and beyond. The teaching load is two courses per semester.

We seek a dynamic individual who can work well with students, faculty, and administrators. Applicants should have at least a Master's degree in mathematics or mathematics education and have excellent teaching credentials. Candidates with a Ph.D. are encouraged to apply.

Interested candidates should send a vitae and three letters of recommendation to: Search Committee, Director of First-Year Mathematics, Department of Mathematical Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295. Review of applications will begin 1 February 2007 and continue until the position is filled.

Michigan Technological University is an Equal Opportunity Educational Institution/ Equal Opportunity Employer/Affirmative Action Employer.

Michigan Technological University
Department of Mathematical Sciences
Tenure-track Position in Statistics
and Probability
Candidates are invited to apply for a tenure-track assistant professorship in Statistics and Probability. Areas of particular interest are Biostatistics, Survival Analysis, Computational Statistics, and Applied Probability. The Department of Mathematical Sciences has 7 statistics faculty and offers BS, MS, and PhD programs in statistics. Faculty are expected to develop a research program, seek external funding, and provide excellent teaching. Teaching loads are very competitive.

The position starts 21 August 2007, and candidates must complete all requirements for the PhD in Statistics, Mathematics, or a related field by that date. Review of applications will begin 1 January 2007 and continue until the position is filled. Interested candidates should send a vita and three letters of recommendation to: Search Committee, Statistics and Probability Position, Department of Mathematical Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295.

Michigan Technological University is an equal opportunity educational institution/ equal opportunity employer/affirmative action employer.

Michigan Technological University
Department of Mathematical Sciences
Tenure-track Position in Algebra
with Applications to Combinatorics
Candidates are invited to apply for a tenure-track assistant professorship in Algebra with applications to Combinatorics. Applications to Cryptography are of particular interest. The Department of Mathematical Sciences has a strong group in discrete mathematics, with expertise in coding and design theory, and offers BS, MS, and PhD programs. Faculty are expected to develop a research program, seek external funding, and provide excellent teaching. Teaching loads are very competitive.

The position starts 21 August 2007, and candidates must complete all requirements for the PhD in Mathematics or a related field by that date. Review of applications will begin 1 January 2007 and continue until the position is filled. Interested candidates should send a vita and three letters of recommendation to: Search Committee, Algebra Position, Department of Mathematical Sciences, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931-1295.

Michigan Technological University is an equal opportunity educational institution/ equal opportunity employer/affirmative action employer.

NEW HAMPSHIRE

Dartmouth College
John Wesley Young
Research Instructorship
The John Wesley Young Instructorship is a postdoctoral, two- to three-year appointment intended for promising Ph.D. graduates with strong interests in both research and teaching and whose research interests overlap a department member's. Current research areas include applied mathematics, combinatorics, geometry, logic, non-commutative geometry, number theory, operator algebras, probability, set theory and topology. Instructors teach four ten-week courses distributed over three terms, though one of these terms in residence may be free of teaching. The assignments normally include introductory, advanced undergraduate, and graduate courses. Instructors usually teach at least one course in their own specialty. This appointment is for 26 months with a monthly salary of $4650.00, and a possible 12 month renewal. Salary includes two-month research stipend for Instructors in residence during two of the three summer months. To be eligible for a 2007-2009 Instructorship, candidate must be able to complete all requirements for the Ph.D. degree before September, 2007. Applications may be obtained at http://www.math.dartmouth.edu/recruiting/. Or, submit a letter of application, curriculum vitae, graduate school transcript, thesis abstract, statement of research plans and interests, and at least three, preferably four, letters of recommendation to Annette Luce, Department of Mathematics, Dartmouth College, 6188 Kemeny Hall, Hanover, New Hampshire 03755-3551. At least one referee should comment on applicant's teaching ability; at least two referees should write about applicant's research ability. Applications received by January 5, 2007 receive first consideration; applications will be accepted until position is filled. Dartmouth College is committed to diversity and strongly encourages applications from women and minorities.

Dartmouth College
The Department of Mathematics anticipates a tenure-track opening with initial appointment in the 2007-2008 academic year. In extraordinary cases, an appointment at a higher rank is possible. Preference given to candidates working in discrete or combinatorial mathematics with connections to existing research interests in the department including discrete probability, graph theory, algebraic combinatorics, combinatorial number theory and discrete geometry. Candidates for the position must also be committed to outstanding teaching and interaction with students at all levels of undergraduate and graduate study.

To create an atmosphere supportive of research, Dartmouth offers new faculty members grants for research-related expenses, a quarter of sabbatical leave for each three academic years in residence and flexible scheduling of teaching responsibilities. The teaching responsibility in mathematics is three courses spread over three of four ten-week terms.

Applications may be obtained at http://www.math.dartmouth.edu/recruiting/. Or, send a letter of application, curriculum vitae, and a brief statement of research results and interests, and arrange for four letters of reference, at least one of which specifically addresses teaching, to be sent to Annette Luce, Recruiting Secretary, Department of Mathematics, Dartmouth College, 6188 Kemeny Hall, Hanover, New Hampshire 03755-3551. Applications received by December 15, 2006 will receive first consideration.

Dartmouth College is committed to diversity and strongly encourages applications from women and minorities. Inquiries about the progress of the selection process may be directed to Dana Williams, Recruiting Chair.

NORTH CAROLINA

Davidson College
The Mathematics Department anticipates an opening for a regular appointment at the Assistant Professor level to begin August 1, 2007. Consult the "Faculty Position" link at http://www.davidson.edu/math/ for information on applying. Davidson College is an Equal Opportunity Employer; women and minorities are encouraged to apply.

OHIO

The College of Mount St. Joseph
Mathematics Faculty/Department Chair Positions
The College of Mount St. Joseph, a Catholic college located in Cincinnati, OH, invites applications for two full-time positions.

Department Chair: Full-time, 10-month contract with a 75% teaching load. Salary and rank are dependent on applicant's credentials. Candidates should have a Ph.D. in mathematics or a related field.

Mathematics Education: Full-time tenure track Assistant Professor in Mathematics Education. Preferred candidates should have a Ph.D. or Ed.D. in Mathematics Education. Candidates with a Ph.D. in mathematics and

a Master's degree in Mathematics Education, or a Ph.D. in mathematics combined with extensive knowledge and experience in K-12 mathematics teaching may be considered.

For complete announcements and the application process, please visit www.msj.edu/employment. The review of applications will begin on Nov. 15, 2006 and continue until the positions are filled. For general information about the college, please visit www.msj.edu. EOE

University of Dayton
Applications are invited for a tenure track position in the Department of Mathematics at the assistant professor level starting in August 2007. The position focuses on mathematics education.

Candidates must have a Ph.D. in mathematics education with a master's degree in mathematics or a Ph.D. in mathematics. Candidates must have a commitment to teaching, advisement, curriculum development, and research supervision at both the undergraduate and graduate levels. The successful candidate will be expected to develop an ongoing professional/research agenda, support outreach programs in cooperation with departmental colleagues and the School of Education, and support a new master's program in mathematics education. Further responsibilities include teaching responsibilities in an undergraduate liberal arts and sciences program.

To receive full consideration, all materials must be received by January 12, 2007. A complete application consists of a resume, three letters of recommendation, a statement of research and professional plans, a statement of teaching philosophy, and a graduate transcript. Both teaching abilities and research abilities should be addressed in the letters of recommendation. Please include an e-mail address in your correspondence.

Send applications to: Dr. Robert Gorton, Chair of the Mathematics Education Search Committee, Department of Mathematics, University of Dayton, Dayton, OH 45469-2316. Contact the search committee at Robert.Gorton@notes.udayton.edu. For further information, see http://www.udayton.edu/~mathdept.

The University of Dayton is a private comprehensive Catholic university founded by the Society of Mary in 1850. It has more than 6000 undergraduate and 3000 graduate students. The Department of Mathematics offers baccalaureate degrees in mathematics and applied mathematical economics, and master's degrees in applied mathematics, financial mathematics, and mathematics education. The University of Dayton is an Equal Opportunity/Affirmative Action employer. Women, minorities, individuals with disabilities, and veterans are encouraged to apply. The University of Dayton is firmly committed to the principle of diversity.

SOUTH CAROLINA

Presbyterian College
Mathematics. Presbyterian College seeks to fill a tenure-track position, beginning August 2007. Any specialization in mathematics or mathematics education considered. Ph.D. preferred; ABDs considered. For further information and application instructions contact www.presby.edu/acad/resources/facemploy.html. We encourage applications from women and members of minority groups. EOE.

TEXAS

Southwestern University
Assistant Professor
The Mathematics and Computer Science Department at Southwestern University seeks applicants for a tenure-track position beginning August 2007. Candidates must possess a Ph.D. in Mathematics or Statistics, a commitment to excellence in undergraduate teaching, and an active interest in scholarly pursuits. For information concerning the Mathematics and Computer Science Department, visit our Web site at http://buzz.southwestern.edu.

Southwestern University is a selective, undergraduate institution committed to a broad-based liberal arts, sciences and fine arts education. Southwestern currently enrolls approximately 1,250 students and maintains a student to faculty ratio of 10 to 1. The University's endowment ranks among the highest per student of undergraduate institutions in the country. In addition to a number of other national organizations, Southwestern University is a member of two consortia of premier liberal arts colleges, the Associated Colleges of the South and the Annapolis Group. Affiliated with The United Methodist Church, Southwestern University is located in historic Georgetown, Texas, in the heart of the Texas hill country, and is 28 miles north of Austin. Southwestern University is committed to fostering a diverse educational environment and encourages applications from members of groups traditionally under-represented in academia. For information concerning the University, visit our Web site at www.southwestern.edu.

For full consideration, all materials must be received by December 15, 2006, but applications will be accepted until the position is filled. Applicants should send a current vita, cover letter, evidence of teaching effectiveness (e.g., syllabi, teaching evaluations, etc.), and three current letters of reference to: Connie Imhof, Faculty Secretary, Mathematics Search, Southwestern University, P.O. Box 770, Georgetown, Texas, 78627-0770. Southwestern University is an Equal Opportunity Employer. EOE/M/F

UNITED ARAB EMIRATES

The Higher Colleges of Technology (HCT)
Overseas Opportunities
Math Foundations Faculty
The Higher Colleges of Technology (HCT) is a system of 14 colleges in 7centers in the United Arab Emirates – one of the most progressive and modern countries in the Middle East. HCT invites applications for Math Foundations Faculty.

The goal of the Math Foundations curriculum is to help students develop the basic math skills necessary to function effectively in their coursework for their chosen majors and to prepare them for work in an international environment.

Faculty candidates are offered a three-year renewable contract with an attractive benefits package which includes competitive tax-free salary, paid annual vacation, unfurnished accommodation, relocation allowance, tuition assistance for dependent children, annual air tickets to country of origin for employee and dependents, end of service benefits…and much more!

For more details on the above positions and to apply, please visit recruit.hct.ac.ae.

WISCONSIN

Carthage College
Faculty Appointment
Mathematics
Carthage invites applications for a new tenure-track position in Mathematics. Candidates must hold the Ph.D. degree in mathematics or a related field at time of appointment. Applicants from all fields of mathematics will be considered. Applicants with an interest in teaching abstract algebra, applied mathematics, or financial mathematics are preferred. In addition to formal scholarly credentials, candidates must have enthusiasm for teaching and undergraduate research in a small college atmosphere. The Mathematics Department at Carthage is dedicated to providing an outstanding educational program through classroom instruction incorporating innovative pedagogical techniques and meaningful undergraduate research experiences. Carthage faculty members are also expected to teach general education courses regularly, includ-

ing mathematics courses for non-majors and Heritage seminars, the College's core curriculum.

Salary and benefits are fully competitive. Dependent upon qualifications and experience, the appointment will be at the rank of Associate or Assistant Professor.

Situated on the shore of Lake Michigan, midway between Milwaukee and Chicago, Carthage offers quick urban access from the relaxed environment of a small city. Founded in 1847, Carthage is affiliated with the Evangelical Lutheran Church in America. Additional information on Carthage and this position is available at http://www.carthage.edu/careers.

Applications including a current curriculum vitae, a statements of teaching philosophy and research interests, and three letters of recommendation should be sent to: Dr. Kevin Crosby, Chair, Division of Natural Sciences, Carthage College, 2001 Alford Park Drive, Kenosha, WI 53140-1994. Applications should be received by November 15, 2006. Carthage College values diversity.

Mathematics Faculty

Stony Brook University's Department of Mathematics is accepting applications for faculty at the Assistant, Associate, or Full Professor level. This position is in the secondary teacher preparation program involving both undergraduate and graduate students. Initial duties include teaching two courses per semester and some administrative duties. Research is also expected. Teaching duties will decrease as administrative duties increase to full leadership of one of the components of the teacher preparation program (currently about 20 undergraduates and 20 graduates per year.)

Required: Doctorate in Mathematics or Mathematics Education. Must have strong potential for creative leadership in mathematics education including research and publications. **Preferred:** Administrative experience, familiarity with NCTM and NCATE standards, secondary school mathematics teaching experience, and experience teaching pedagogy courses is highly desirable.

Salary and rank commensurate with experience. Review of applications will begin December 1, 2006.

To apply, please send cover letter, CV, and at least three letters of reference to:
Mathematics Education Search
Department of Mathematics
Stony Brook University
Stony Brook, NY 11794-3651

Fax: (631) 632-7631

Equal Opportunity/Affirmative Action Employer. Visit *www.stonybrook.edu/cjo* for employment information.

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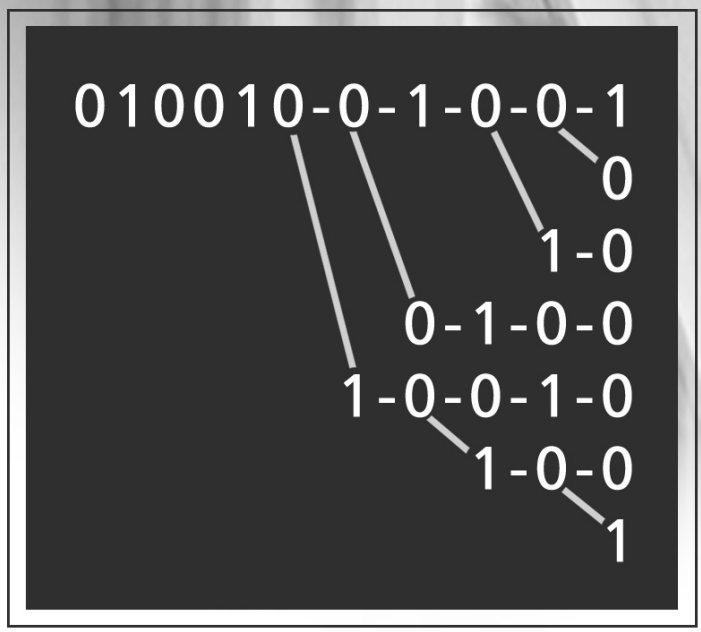

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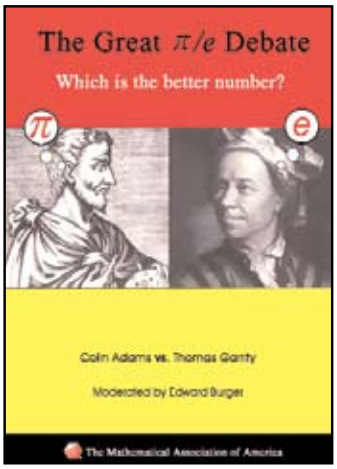

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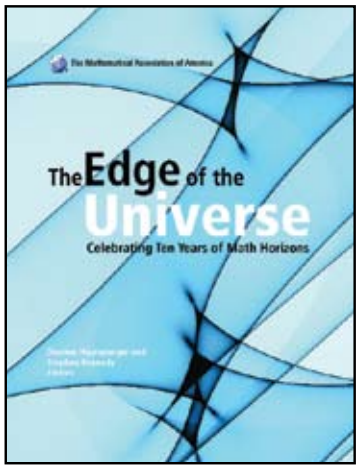

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