FOCUS

Volume 27 Issue 2

Inside

On the cover: Since the Joint Meetings began on the 12th day of Christmas, it was only appropriate that mathematicians be greeted, in the lobby of the Sheraton, by a New Orleans-style Santa and his alligators.

FOCUS Deadlines

	May/June	August/September	October
Editorial Copy	March 9	June 9	
Display Ads	March 9	June 9	August 1
Employment Ads	March 24	June 16	August 13

MAA's Math Gateway Now Online

MAA's new NSF-supported digital library project, *The Math Gateway*, a pathway within the National Science Digital Library (NSDL) is now online at http://mathgateway.maa.org.

The Math Gateway is the only mathematics pathway among the NSDL's nine "pathway projects," each of which has stewardship for a particular community of users. At *Math Gateway* you can simultaneously search for online mathematics materials held by 17 partner collections, including all the components of MathDL, Math Forum, MathWorld, PlanetMath, the National Curve Bank, Demos With Positive Impact, iLumina Digital Library, causeweb.org, the Connected Curriculum Project, Virtual Laboratories in Probability and Statistics, the Mathematics Survey, the Ethnomathematics Digital Library, and the NSDL Middle School Portal. The Gateway home page also features a *Math in the News* column, new each week. Soon a new *Math in the News* column will appear each working day.

If you register at *The Math Gateway*, your My Library section enables you to collect particular resources and share selected ones with a list of friends and colleagues. You may upload small files to your Library, work on them collectively with those your list, and discuss topics of common interest.

The NSDL (see http://nsdl.org) is an NSF-sponsored program that was begun in 2000. Currently there are over 200 individual projects supported by the program, and the NSDL database has information on more than two million online materials and services. MAA's *Mathematical Sciences Digital Library*

(MathDL) at http://mathdl.maa.org is one of the original NSDL collections.

In addition to *Math Gateway*, other NSDL pathway projects include:

- comPADRE, for physics, at http://compadre.org

- MatDL, for materials science, at http://matdl.org

- Engineering Pathway, at http://engineeringpathway.org

- BiosciEdNet (BEN), for biology, at http://www.biosciednet.org.

- Shodor Foundation, for computational science, at http://shodor.org

- Applied Math and Science Education Repository, with resources for two-year schools, at http://amser.org

- Teachers' Domain at WGBH, with professional development for K–12 teachers, at http://teachersdomain.org

- NSDL Middle School Portal, the remaining public part of the Eisenhower National Clearinghouse, at http://msteacher.org

- ChemEd Digital Library, being created by the *Journal of Chemical Education.*

Lang Moore is the Director of the Math Gateway and the Executive Editor of MathDL. He can be reached by email at lang@math.duke.edu.

Ivars Peterson Named MAA Director of Publications for Journals and Communications

The MAA is pleased to announce it has selected Ivars Peterson as its new Director of Publications for Journals and Communications. Peterson will begin working with the Association at its Washington headquarters on Monday, March 5, 2007. In his position as Director, Peterson will be overseeing the MAA's journals and other periodicals, both in print and electronic. He will also oversee the content and resources available at the MAA's website. His other activities will entail duties related to communications from the MAA to its members, its sections, the public, and other constituencies.

Peterson has an M.A. in Journalism from the University of Missouri-Columbia, a B.Ed. in Education and a B.Sc. in Physics and Chemistry from the University of Toronto. He is currently a writer at *Science News* and editor of *Science News Online* and *Science News for Kids*. Peterson is also a weekly mathematics columnist for *Science News Online* and *FOCUS Online*, where his *MathTrek* column has been a perennial favorite. He is the author of several books, including *Mathematical Treks: From Surreal Numbers to Magic Circles*, published by the MAA. He previously worked as a high school science and mathematics teacher.

We are very pleased that Peterson will be joining the MAA and welcome him to the staff and the leadership team.

Ivars Peterson

Furstenberg and Smale Will Share the 2006–2007 Wolf Prize

The 2006–2007 Wolf Prize in Mathematics will be shared by Harry Furstenberg of the Hebrew University of Jerusalem and Stephen Smale of the University of California at Berkeley. The prize, which has a total value of $100,000, is one of seven prizes given annually by the Wolf Foundation to recognize achievement in different areas of science and the arts. The prize will be formally awarded in Israel this May.

Furstenberg was honored "for his profound contributions to ergodic theory, probability, topological dynamics, analysis on symmetric spaces and homogeneous flows." Smale was honored for his "ground-breaking contributions that have played a fundamental role in shaping differential topology, dynamical systems, mathematical economics, and other subjects in mathematics." More details, including a more complete description of the mathematical achievements of both men, can be found at the Wolf Foundation web site at http://www.wolffund.org.il.
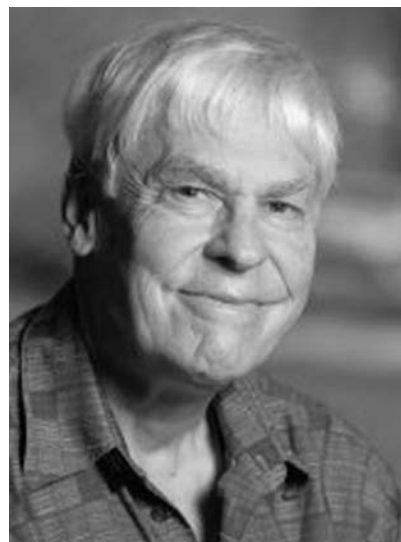
Stephen Smale
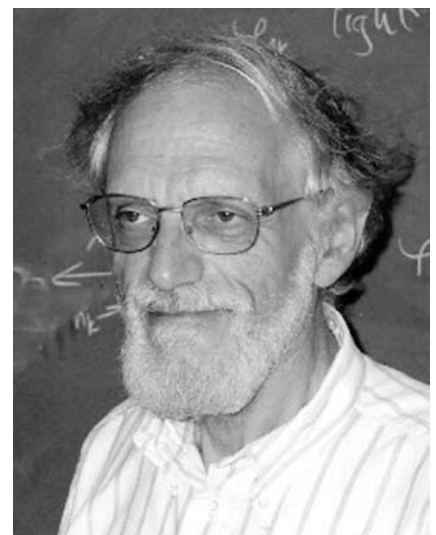
Harry Furstenberg

Bylaws Change on the Agenda
for MAA Business Meeting at the San José MathFest

By Martha J. Siegel, MAA Secretary

The MAA Board of Governors, at its meeting on January 4, 2007, passed the following Bylaws changes to allow flexibility in meeting government regulations for organization audits.

Currently, two members of the Association are elected by the Board to serve on the Audit Committee for terms of four years. Members of the Audit Committee plus the Treasurer form the MAA's Budget Committee, and all members of the Budget Committee are members of the Executive Committee and of the Board of Governors. These Bylaws changes allow for the possibility that we *appoint* someone with specific expertise in non-profit accounting practices to serve on the Audit Committee. Such a person would not be a member of the Budget Committee, the Executive Committee or the Board of Governors. The expectation is that if this is done, at most one such person would be appointed to the Audit Committee.

MOTION 1:
To change the current Article III, Section 3:

There shall be an Executive Committee of the Board consisting of the Officers of the Association, the chair of the Committee on Sections (see Article VI.7), the members of the Audit Committee (see Article IX.3), and a current journal editor or the chair of the Committee on Publications. It shall be the function of this Committee to review continually the policies and activities of the Association, to plan and organize new activities, to formulate in broad outline the programs of meetings and of publications, to act on behalf of the Board on all financial matters as specified in Article IX, and in general to consider all matters of importance or interest to the Association. This Committee shall prepare the agenda for meetings of the Board and shall analyze the implications and aspects of all matters which are to come before the Board for decision. It shall present to the Board the viewpoints suggested by such analyses, as well as all such facts as may seem pertinent or as may in any way facilitate the Board's work.

by inserting the word '**elected**' before the words 'members of the Audit Committee.'

MOTION 2:

To change the current Article IX. 3:

The accounts of the Association shall be audited annually by a certified public accountant (the auditor). There shall be an Audit Committee, a subcommittee of the Executive Committee, consisting of two members each elected by the Board in alternate even-numbered years for a term of four years. The Audit Committee shall be responsible for selecting the auditor, receiving the report of the auditor, and making recommendations based on the auditor's report to the Executive Committee.

by changing the second sentence to:

There shall be an Audit Committee whose membership includes two members who are elected by the Board in alternate even-numbered years for a term of four years.

As specified in the Bylaws, these changes must be approved at the next MAA Business meeting, during MathFest, which will be held in San José, CA, on August 3–5, 2007.

Awesome Math in 2007

By Titu Andreescu

We're going to do it again! About this time last year, I sent an e-mail to mathematics teachers and educators all around North America announcing a brand new program for middle and high-school students interested in spending part of their summer immersed in enriching mathematics. Despite starting from scratch, *AwesomeMath* had an extremely successful inaugural summer camp in 2006, with 101 students from seven countries participating.

The 2007 *AwesomeMath Summer Program* will be held on July 16–August 6, once again at the University of Texas at Dallas. We are assembling our faculty and staff and hope once again to have a successful summer. To find out more, visit http://www.awesomemath.org, which also has information about our year-round training program and the free online journal *Mathematical Reflections*.

Titu Andreescu is an Associate Professor in the Department of Science and Mathematics Education at the University of Texas at Dallas. He is a former director of the MAA's AMC program and the author of many books.

Top *n* Reasons to Attend the PCUMC

By Alissa Crans

0. A math conference designed specifically for undergraduates!

1. Free registration!

2. Free lunch!

3. Talks for undergraduates by undergraduates.

4. Special sessions featuring talks by freshmen and sophomores.

5. Dynamic guest speakers, including Dylan Kohler from Electronic Arts, Don Schmidt and Joshua Schpok from Dreamworks Animation and representatives from the NSA, Raytheon, RAND, and Northrop Grumman.

6. Raffle prizes for participants, including recent XBox and PS2 video game titles!

7. Math trivia contest.
     ⋮

n **– 3**. Panel discussion about graduate school.

n **– 2**. Panel discussion about career opportunities.

n **– 1**. Homemade cookies!

n. A captive audience for sharing undergraduate research projects, senior theses, really cool problems from class, and biographical or historical information about mathematicians!

The Pacific Coast Undergraduate Mathematics Conference will be held on March 31, 2007 at Pepperdine University in Malibu, CA from 8 am to 4 pm. Information about the conference, including registration details, can be found on the conference website at http://www.pcumc-math.org. PCUMC is sponsored by Pepperdine University, Loyola Marymount University, and Lewis and Clark College and receives major funding from an NSF Grant DMS-0241090 through the MAA Regional Undergraduate Mathematics Conference program.

"Experimental Mathematics in Action" in the North Central Section's Summer Seminar

The theme for this year's Summer Seminar of the North Central Section of the MAA is "Experimental Mathematics in Action: Insight through Computation." The principal lecturer will be Jonathan Borwein of Dalhousie University. The event will be held at Carleton College in Northfield, MN, on July 16–20.

The program will focus on how computers have allowed us to "see" previously unobservable mathematical phenomena, making mathematics much more of an experimental science than it has ever been. Jonathan Borwein is one of the leaders in this area. His recent book, *Experimental Mathematics in Action*, will be the starting point for the seminar. Borwein will "present a coherent variety of accessible examples of modern mathematics where intelligent computing plays a significant role and in so doing to highlight some of the key algorithms and to teach some of the key experimental approaches."

For more information, visit http://www.math.carleton.edu/comp_math/ or contact Steve Kennedy at skennedy@carleton.edu.

MathFest 2007: Call for Student Papers

The deadline for receipt of applications for student papers to be presented at the 2007 MathFest in San José is Friday, June 15, 2007. Students may not apply for funding from both MAA and PME. Every student paper session room will be equipped with a standard overhead projector, a computer projector, and two screens. Each student talk is 15 minutes in length.

MAA Sessions
Students who wish to present at the MAA Student Paper Sessions at MathFest 2007 in San Jose, California must be sponsored by a faculty advisor familiar with the work to be presented. Some funding to cover transportation costs (up to $600) for student presenters who are members of the MAA is available. At most one student will be funded from each institution and each REU.

All presenters are expected to take full part in the meeting and attend activities sponsored for students on all three days of the conference. Nomination forms and more detailed information for the MAA Student Paper Sessions will be available at www.maa.org/students/undergrad/ by March 1, 2007.

Pi Mu Epsilon Sessions
Pi Mu Epsilon student speakers must be nominated by their chapter advisors. Application forms for PME student speakers will be available by March 1, 2007 on the PME web site www.pme-math.org or can be obtained from PME Secretary-Treasurer, Dr. Leo Schneider leo@jcu.edu. A PME student speaker who attends all the Pi Mu Epsilon activities is eligible for transportation reimbursement up to $600, and up to five speakers per Chapter may be eligible for full or partial reimbursement.

HRUMC XIV to be Held at Siena College

The 14th annual Hudson River Undergraduate Mathematics Conference will be held at Siena College in Loudonville, New York on April 21, 2007. The conference includes presentations on mathematics by both faculty and students, and both are encouraged to participate. Conference sessions are designed so that some presentations are accessible to undergraduates in their first years of study, and others are accessible to third or fourth year undergraduate mathematics majors. The keynote speaker for this year will be Georgia Benkart, Professor of Mathematics at the University of Wisconsin at Madison. For more information, visit the conference website at http://www.skidmore.edu/academics/mcs/pages/hrumc.htm. Those wishing to make a presentation at the conference should submit an abstract via the website by February 25th, 2007.

In FOCUS: The 2007 Joint Mathematics Meetings

By Fernando Q. Gouvêa

The 2007 Joint Mathematics Meetings were held in New Orleans on January 5 to 8. Over 5,000 participants descended on the Big Easy for several days of mathematics in all its glorious variety, from Leonhard Euler to Pixar Animation, with stops in between for outer space, bar codes, all areas of mathematics and mathematics education, music, and Groningen. The exhibit hall started from the usual displays of books and software, but also included jewelry, accessories, toys, 'glass geometry,' and booths promoting institutes, universities, journals, and even government agencies. The undergraduate student poster session attracted a huge crowd of bright students showing off their research, and a huge crowd of adult mathematicians admiring it. Surrounding the meeting were many social events, mini-courses, meetings of the MAA Board of Governors and the AMS Council, and more committee meetings than most participants really wanted to know about.

New Orleans is still in many ways a city in distress, and the memory of the destruction following Hurricane Katrina was ever present. In an effort to offer some help, the meeting organized a sale of t-shirts and a raffle with lots of very nice prizes. The proceeds went to a local charity, the Second Harvest of New Orleans Food Bank, and specifically to their BackPack Program, which provides food for children who otherwise might go hungry. I like this idea a lot, and hope that the organizers will consider doing the same in future meetings, since there are no cities without social problems. Folks can use the help, and the mathematical community has the resources to offer it.

The meeting events were distributed among two hotels, the Marriott and the Sheraton, which face each other across Canal Street, just next to the French Quarter. Participants who arrived early (for example, to attend the mini-courses, as I did) got to experience a little bit of the excitement of the Sugar Bowl, since the Marriott was the official headquarters of Notre Dame fans, while the Sheraton

was mostly filled with Louisiana State supporters. On the night of the game, the name and logo of each team was projected onto the façade of the appropriate hotel, prompting (unfulfilled!) dreams of seeing the MAA and AMS logos similarly displayed.

Splitting the meeting into two hotels generates interesting questions which I hope some of our more modeling-oriented readers might want to consider. The main talks were given on the 5th floor of the

The Sheraton lobby as LSU Headquarters for the Sugar Bowl.

Sheraton, and the exhibits were located on the 3rd floor of the Marriott, with other events distributed throughout the surrounding floors. As a result, at any given moment there were lots of mathematicians either crossing Canal Street (thankfully, not a very busy street) or on the escalators. Whoever calculated the maximum demand on the escalators must have done a fairly good job, since I only saw one broken escalator over the several days of the meeting. On the other hand, the throughput could have been better. The escalators only just handled the numbers at the peak moments, such as just before and just after a popular talk.

The Marriott featured an innovative elevator system that generated some discussion during the meeting. To call the elevator, one had to punch in the floor one was trying to reach. The device would then indicate which elevator would take us there. Inside the elevator, there were no buttons to press except for door open/close and emergency buttons. A panel on the inner door lighted up to indicate at which floors it would be stopping. Surely this system was intended to improve efficiency, and not just to render impossible schoolboy pranks… but the comments I

heard suggested that most people were not too impressed. Had the programmers not expected a hotel that full, or are mathematicians just picky? Analyses of the situation would be welcome!

The articles that follow give a snapshot of the meeting and some of what happened there. MAA Secretary Martha Siegel reports on what was decided at the meeting of the Board of Governors and at the MAA Business Meeting. Diana Thomas writes about the student poster session, and Joe Gallian (President of the Association as of the end of the meeting) reports on two exceptional undergraduates who received prizes for their research. A report on prizes and awards given at the meeting and a large photo spread complete our section on the JMM.

The next national meeting of the MAA is this summer in San José, and the next Joint Mathematics Meetings will be next January in San Diego. We'll see you there.

Fernando Q. Gouvêa is Carter Professor of Mathematics at Colby College and the editor of FOCUS.

JMM 2007: Report of the MAA Secretary

By Martha J. Siegel

It was a leap of faith that moved us to adhere to the plans to meet in New Orleans, as originally scheduled, long before Katrina. We were rewarded by having the all-time largest registration for the Joint Mathematics Meetings. I want to thank the MAA and AMS Meetings Staff, and MAA Associate Secretary, Jim Tattersall, for the success of these meetings. The Program Committee chose an outstanding list of invited speakers and all those who attended added substantially to the vibrant and friendly atmosphere. I note that more than 400 undergraduates attended this meeting. Thanks to the various MAA committees and individual faculty members who have contributed to this excellent undergraduate turnout demonstrating interest in and support for mathematics.

I will review briefly the matters discussed by the Board of Governors at its meeting on January 4 and mention one or two items of note from the MAA Business Meeting.

Our bottom line in 2005 was an operating surplus of almost $600,000. As a result, we have added substantially to our endowment. We cannot afford to rest on these laurels, though. Our endowment is still far from what would be ideal for an association of our size. External funding is likely to become more competitive, especially in the collegiate mathematics area, so we will continue to try to increase revenue and control spending. The Carriage House is already being used for meetings, and eventually we hope that it will be a source of added revenue. Grand Opening ceremonies will be held in April. More information will be available on the MAA web site.

The 2005 audit was very positive, reflecting the great improvement in Association finances and financial procedures in recent years. The total income from publications in 2006 seems to be on target. Much of this is due to the efforts of former Associate Executive Director

Board meets in New Orleans.

Don Albers in bringing our publications to a larger market through agreements with Cambridge and Amazon.com and through the efforts of the book series editors who keep excellent titles coming. Although Don Albers has left the position of Associate Executive Director and Director of Publications, Publications are in good hands: Don continues to manage acquisitions from his base in California, Elaine Pedreira is heading the Books program and Carol Baxter is acting Director for Journals and Communications.

As you may already know, Tina Straley and the Executive Committee, with Board approval, have decided to spend some time revisiting our goals and strategic plans for the next five years, ten years, and so on. (See the January issue of FOCUS, starting on page 18.) At these meetings we received the final reports of the working groups in three important areas: Revenue, the American Mathematics Competitions, and Professional Development. The working groups on each of these areas, chaired by Barbara Faires, Frank Farris, and Nancy Hagelgans, presented reports to the Board and these will be posted on the website shortly after these meetings. I urge you to read them. Meanwhile, we are in the midst of Cycle II with working groups in three new areas: Membership (chair: Carl Pomerance), Governance (chair: Carl Cowen), and Students (chair: Deanna Haunsperger). The Board voted to add Meetings, Sections, and STEM issues for study in Cycle III to begin this spring.

The format of Board meetings has changed somewhat in that we have had breakout sessions to discuss strategic planning for part of the day. The Board itself suggested a more active role in the focus groups held last August and the implementation has made for some interesting discussions so far!

We have launched a new project with the American Institute of Physics (AIP), nominating Joe Gallian and Carl Pomerance as our Advisory Board to AIP. Visit http://www.aip.org/dbis/ to see what we're up to. In addition, we have endorsed a film project on the Mathematical Olympiad Program. President Joe Gallian and AMC Director Steve Dunbar are taking the lead on that.

The Euler Prize, endowed by funds contributed by Paul and Virginia Halmos, was given this year for the first time, in celebration of the 300th anniversary of Euler's birth. The award winner is John Derbyshire for his book, *Prime Obsession*. The MAA study tour this summer will trace Euler's life (1707-1783) from Basel to St. Petersburg. This is the *MAA Year of Euler*, and celebrations included a mini-course at the Joint Meetings and the release of two new books on Euler, complete with cake for the birthday boy. Three more books will come during the year, and there will be many Euler-related events at MathFest. I urge you take advantage of the posters, the books, the courses, and the Study Tour highlighting the mathematical contributions of Euler.

An Ethics and Whistleblower Policy was recently adopted by the Board to comply with the requirements of the Sarbanes-Oxley Bill. At the Business Meeting, an addition to the MAA Bylaws was formally approved. It provides a mechanism for removal from office in case of serious violations.

Addition to the MAA Bylaws, approved at the MAA Business Meeting on January 8, 2007.

Article IV. 9. Persons appointed to positions within the Association may be removed from office by the entity that appointed

Pictured left to right are MAA staff members who worked on the meeting: Bryan Lane, Bob Anastasio, Jim Tattersall, Becky Roemen, and Calluna Euving.

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.

The Board passed several other Bylaws changes that can be found online and elsewhere in FOCUS (see page 5). They will be brought to a vote by the membership at the Business Meeting in San Jose this summer.

Daniel Maki, member of the Audit and Budget Committees, has taken a position with the NSF this year. He has resigned from these two committees and the Board has elected Richard Cleary of Bentley College to serve for one year as his replacement and then for a four-year term to replace Jim Daniel, whose second and final term ends this time next year. Dan has been a thoughtful, articulate, and hard-working member of these two committees and a true asset to the Executive Committee and the Board of Governors. We miss him and wish him well!

The Board approved the 2007 Budget and the 2008 Dues. We are finishing the work for the 2007 elections. The Nominating Committee for the 2007 Elections was chaired by Ann Watkins. Wade Ellis, Barbara Faires, Ron Graham, and Betsy Yanik served on the committee. We will continue to use a mix of electronic and paper ballots. We will be electing new officers, including a new president, who will serve a year as President-Elect during 2008 and become president at the end of the 2009 Joint Meetings.

Daniel Velleman of Amherst College is now the Editor of the *American Mathematical Monthly* and will serve a five-year term that began January 1, 2007. We again thank Bruce Palka for doing a splendid job as Editor of the *Monthly* and for his dedicated service as a member of the Board. Searches are now underway for new editors of the *College Mathematics Journal* and of *Math Horizons*.

The Board approved a template for Section bylaws. The Committee on Sec-

tions established a schedule for periodic review of section bylaws and this should streamline the process for the sections and the Board.

I want to take this opportunity to thank those governors whose term on the Board has expired: Tom Banchoff as a Former President; Jonathan Borwein as Governor-at-Large for Canadians; and Nathaniel Dean as Governor-at-Large for Minority Interests. We will miss the contributions of these three active members, and look forward to their continued involvement with the work of the Association. Governors-at-Large, elected by the Board to begin a three-year term beginning after these Joint Mathematics Meetings are: Camille McKayle, Governor-at-Large Representing Minorities, replacing Nate Dean and Andy Liu, Governor-at-Large Representing Canadian Mathematicians, replacing Jonathan Borwein.

Those Section Governors who will serve on the Board until July, 2007 but for whom this was the last Board meeting are: Doug Ensley (EPADEL), David Kerr (Florida), Richard Wilders (Illinois), David Wright (Intermountain), James Freeman (Iowa), Roger Waggoner (Louisiana-Mississippi), David Carothers (MD-DC-VA), Ruth Favro (Michigan), Dan Kemp (North Central), Art Benjamin (Southern California-Nevada), and Elizabeth Bator (Texas). The three years of their terms have flown by! Most of these members are already actively enrolled as committee members. Join me also in wishing a speedy and complete recovery to our colleague, Jim Bruening, Governor of the Missouri Section. We look forward to seeing him in San Jose.

The schedule of future meetings of the Association is:

    August 3–5, 2007, San Jose, CA
    January 6–9, 2008 San Diego, CA
    July 31–August 2, 2008, Madison, WI
    January 7–10, 2009, Washington, DC
    August 6–8, 2009, Portland, OR
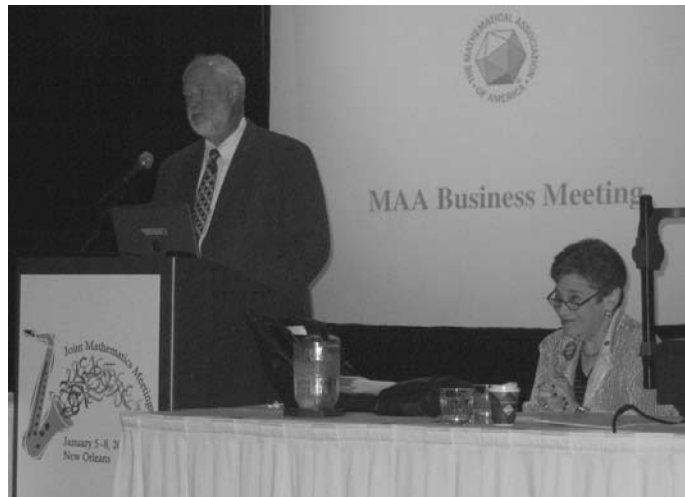
President Carl Cowen and Secretary Martha Siegel at the MAA Business Meeting.

    January 6–9, 2010, San Francisco, CA
    August 5–7, 2010, Pittsburgh, PA
    January 5–8, 2011, New Orleans, LA
    January 4–7, 2012, Boston, MA
    January 9–12, 2013, San Diego, CA
    January 15–18, 2014, Baltimore, MD
    August 5–8, 2015, Washington, DC

The last of these is our *Centennial Meeting*. The Co-Chairs of the Centennial Celebration Committee, Deanna Haunsperger and Steve Kennedy, have some great plans!

I want to thank Tina Straley, Michael Pearson and the rest of the MAA staff. They have been instrumental in making the MAA a vibrant and intellectually exciting professional organization. I thank my assistant, Denise Raspa, whom most of you know only by her electronic name draspa@towson.edu. She has been a tremendous help to me. She and Calluna Euving at MAA have been working diligently to simplify and streamline our operations. I thank them both for making my job so much easier.

Of course, these meetings cannot take place without the concerted effort and the considerable skill of many people. We acknowledge the staff in Washington, our Associate Secretary, Jim Tattersall, and the volunteers who have served on the program committee and the local arrangements committee, as well as the many folks who have given papers and run sessions.

The members of the MAA Program Committee for January 2007 in New Orleans were Frank Farris (chair), Jerome Goldstein, Tom Moore, Michael Neumann, Talmage James Reid, V. Frederick Rickey, Don Saari, Carol Schumacher, James Tattersall *(ex off.)*, and Sylvia Wiegand. The members of the Joint AMS-MAA Program Committee for New Orleans 2007 were Frank Farris (MAA), Gail D. Ratcliff (AMS), Donald Saari (MAA), and Michael Starbird (AMS) (Chair).

It's perhaps worth noting that Jim Tattersall's term as Associate Secretary will end in February 2009, and that we are actively searching for a new Associate Secretary, who will spend a year as Associate Secretary Elect learning the ropes. See the MAA web site for specifics and details.

We have lost several wonderful friends of the MAA since MathFest. G. Bailey Price, who was President of the MAA in 1957 and 1958, died November 7. Paul Halmos (1919-2006), a great friend of the MAA, died in October, Leon Henkin died on November 1 at his home in Oakland, CA. and Don Kreider, former Treasurer and President died suddenly at his home on December 7th. See the *In Memoriam* Section of Focus Online for more information on these outstanding men.

Carl Cowen handed the gavel to our new President, Joseph Gallian, at the MAA Business Meeting. This marked the end of Carl's two-year term as President. It has been a pleasure to serve under Carl. His quiet and steady leadership and his interest in drawing a diverse group of mathematicians into the governance of the MAA have made the MAA a stronger and more inclusive organization than ever. I am sure I represent the entire leadership of the Association in thanking him for his service. We welcome President Joe Gallian with enthusiasm.

Martha Siegel teaches at Towson College in Maryland and is Secretary of the Association.

Undergraduates Win Awards in New Orleans

By Joe Gallian

At the Joint Meetings in New Orleans Ana Caraiani won the Alice T. Schafer Prize given by the Association for Women in Mathematics for Excellence in Mathematics. Ana, a senior at Princeton, was cited for her research in number theory, her performance in her classes, and for being a winner of the Putnam Competition in both her freshman and sophomore years. One of her letters of support stated that she ranked among the top undergraduate mathematics majors that the author had seen in his fifty years at Princeton.

Ana's number theory research focused on determining the structure of the multiplicative semigroups of rational numbers having generators of the form $(An + B)/(Cn + D)$ where $n \geq 0$ for specific integer choices of A, B, C, D, with and without adjoining 1/2 or other rational numbers as generators. The case $(3n + 2)/(2n + 1)$ is known as the 'weak $3x + 1$' problem.

In this case she answered a question raised by Jeff Lagarias and extended the methods of Applegate and Lagarias for completely describing the rationals in the desired semigroup for a general class that includes the case where the generators are of the form $(5n +3)/(2n + 1)$, together with 1/2, thereby giving a complete answer to 'weak $5x + 1$' problem. Ana is currently doing a senior thesis under the supervision of Andrew Wiles and intends to study mathematics in graduate school in the fall.

Daniel Kane, a senior at MIT, won the AMS/MAA/SIAM Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student. The selection committee wrote 'At this early stage of his mathematical career, Daniel has already established a research record that would be the envy of many professional mathematicians.'

He has eleven papers on diverse topics that have been published or have been accepted for publication in main stream professional journals such as the *Pro-*

Joe Gallian with Ana Caraiani and Daniel Kane at the Awards Ceremony.

The Schafer Prize: AWM President Barbara Keyfitz, Alyson Deines (honorable mention), Yaim Cooper (runner-up) and Ana Caraiani (winner).

ceedings of the American Mathematical Society, the *Journal of Number Theory*, and *Integers: The Electronic Journal of Combinatorial Number Theory*.

In one paper he proved an open conjecture stated by a well-known number theorist. In another he improves a famous result that Erdös published in the *Annals of Mathematics*. In two others he answers questions posed by Ken Ono and Kiran Kedlaya.

Daniel is a three-time winner of the Putnam competition. He is currently doing research with Eric Demaine and will study mathematics in graduate school this fall.

Joe Gallian is the President of the MAA. He teaches at the University of Minnesota-Duluth, where he also runs the world's best summer research program for undergraduates.

Undergraduate Students at the Joint Meetings

By Betty Mayfield

Almost five hundred undergraduate students — a new record — participated in the Joint Mathematics Meetings in New Orleans. They were welcomed at a special reception on Friday night, where they munched on New Orleans King Cake and drank (non-alcoholic) hurricanes while chatting with other students. They attended invited and contributed talks, they hung out in the student hospitality suite, they enjoyed the MAA Student Lecture ("Mathematics: A Question of History," given by Della Fenster of the University of Richmond), and they showed off their considerable mathematics skills. One hundred sixty-nine students displayed the results of their research projects at the Undergraduate Poster Session, and sixty-seven students from summer REUs gave talks about their work. Undergraduate students have become an important part of the Joint Meetings, accounting for almost 10% of the attendees. It is exciting to see the future of the profession in these talented and energetic students.

Betty Mayfield is the chair of the MAA Committee on Undergraduate Student Activities and Chapters.

He found the baby in the King Cake.

(Non-alcoholic) Hurricanes

Students from Oakwood College.

The Undergraduate Poster Session 2007

By Diana Thomas

Every year the number of posters entered in the Undergraduate Poster session at the Joint Mathematics Meetings increases tremendously. This year was no exception. There were a total of 175 poster submissions on topics ranging from the spread of fear to elliptic curves. Every student who presented a poster had an interesting account of their research experience and its consequent impact. I was able to talk to several students about their experience prior to the session and share a few of them with you here.

It is with pride that I note the dedication and enthusiasm with which our mathematics community reaches out to undergraduates in order to engage them in a research experience. Many undergraduate students are approached in their individual classes by their professors. Victor Camacho, a mathematics major at Harvey Mudd College began his research project on a generalization of the Burger's Equation, a partial differential equation model describing turbulence in viscous fluids, after an interesting proposal was provided by his professor John Jacobson. He was very passionate about his research and is interested in continuing his work upon returning to Harvey Mudd. Other students are able to generate and focus research interest through REU (Research Experiences for Undergraduates) programs. Mathew Stamps attended an REU at Valparaiso University that involved undergraduates in research on a range of different topics. He discovered he really enjoyed pure mathematics. On returning to his home institution of Grand Valley State University he asked his advisor David Austin for an appropriate research topic. His work resulted in his prize winning poster on Circle Packings and Penrose Tilings.

One of the wonderful aspects of the poster session is that it provides not only the raw academic results of student research but also the personal excitement and electricity of student achievement. As I passed Adam Gouge's poster on Affinely Self-Generating Sets and Morphisms, he proudly held up page proofs

Student authors of the winning posters at the JMM 2007 Undergraduate Student Poster Session. Photograph by Gordan Woodward of the University of Nebraska Lincoln.

of his paper accepted only a week ago at the *Journal of Integer Sequences*. Adam had responded to flyers at Truman State University advertising the STEP program. His consequent work with David Garth from Truman State University led to the publication and his poster at the session. Each student I spoke to had similar high impact stories and they were delighted to share their experiences with our mathematics community.

Management of the poster session was handled by a large group of mathematicians, MAA and AMS staff, and student volunteers. There were over 180 professional mathematicians who volunteered as judges for the poster session this year! A large percentage of former judges returned this year and I thank them for their continued support of the session. Every year Aparna Higgins from the University of Dayton recruits Project NExT fellows to judge the session and we certainly could not run the judging portion without their involvement.

As the poster session continues to grow, Jim Tattersall (Associate Secretary of the MAA), Michael Pearson (Director of Programs and Services), Hal Nesbitt (MAA Program Coordinator), and Donna Salter (AMS Program Coordinator), continue to improve and streamline the application process and coordination of

the event on that day. Suzanne Lenhart, Chair of the Committee on Undergraduate Research, organized awards and the judging table on the day of the event. Michael O'Leary from Towson State University set up a new electronic scoring system, which reduced scoring time by an hour. Members of the MAA Committee on Student Activities and Chapters spent time assisting in organization of the session on the day of the event.

I would like to especially thank Margaret Robinson from Mount Holyoke College who came before the session started and stayed until the session was over, putting out many fires. In addition, Mario Martelli from Claremont McKenna College who first organized and grew the session to the event it is today continues to assist me with organizational aspects and scoring. Many more people were involved in running the session smoothly and to all of them we express our appreciation. We expect the session to continue to grow and I look forward to seeing everyone in San Diego next year!

A list of all the prize winning posters, with advisors and institutions, can be found online at http://www.maa.org/students/undergrad/07winners.html.

Diana Thomas is an associate professor at Montclair State University.

Prizes and Awards at the 2007 Joint Mathematics Meetings

By Fernando Q. Gouvêa

The Joint Mathematics Meetings bring together not only the MAA and the American Mathematical Society (AMS), but many other mathematical associations. The special session for prizes and awards, held on January 6, included many MAA prizes (several other MAA prizes are awarded at the summer MathFest, of course) and all of the annual prizes given by the AMS. In addition, prizes were awarded by the Association for Women in Mathematics (AWM), the Society for Industrial and Applied Mathematics (SIAM), and the Joint Policy Board for Mathematics (comprised of MAA, AMS, SIAM, and the American Statistical Association (ASA)).

This report lists all of the prizes awarded. For details about the prizes, including the official citations, brief biographies of the prize winners, and responses, visit the MAA awards site (use the "About the MAA" pull-down menu) or go directly to http://www.maa.org/Awards/JMM07.pdf.

MAA Prizes and Awards

At the Joint Meetings, the MAA announced its most prestigious award, the Gung and Hu Award for Distinguished Service to Mathematics. A detailed account of the work and achievements of the winner will appear in a future issue of the *American Mathematical Monthly*. Also announced are three important writing prizes: the Euler and Beckenbach book prizes and the Chauvenet Prize. The Euler Prize, a new addition, was endowed by Paul and Virginia Halmos and honors "the author or authors of an outstanding book about mathematics," with emphasis on mathematical exposition. The Beckenbach Prize is given for a "distinguished, innovative book published by the MAA. The award is not given on a regularly scheduled basis, but is given only when a book appears that is judged to be truly outstanding." The Chauvenet Prize is given "to the author of an outstanding expository article on a mathematical topic by a member of the Association."

In addition, the MAA recognized the winners of this year's Haimo Awards, given for distinguished college or university teaching of mathematics, and awarded six Certificates of Meritorious Service, presented for service at the national level or for service to a Section of the Association.

Deborah and Franklin Tepper Haimo Awards for Distinguished College or University Teaching of Mathematics

Jennifer Quinn
Association for Women in Mathematics

Michael Starbird
University of Texas at Austin

Gilbert Strang
Massachusetts Institute of Technology

Chauvenet Prize

"The Gravity of Hades," *Mathematics Magazine*, Vol. 75, No. 5, December 2002, pp. 335-350.

Andrew J. Simoson

Beckenbach Book Prize

Math through the Ages, Expanded Edition (MAA and Oxton House, 2004)

Fernando Q. Gouvêa and William P. Berlinghoff

Certificates of Meritorious Service

Florida Section

Marilyn Repsher

Kansas Section

Sister Jo Ann Fellin

Michigan Section

Jerrold W. Grossman

Northeastern Section

Donna Beers

Rocky Mountain Section

Janet Heine Barnett

Texas Section

Stuart Anderson

Yueh-Gin Gung and Dr. Charles Y. Hu Award forDistinguished Service to Mathematics

Lee Lorch

Euler Book Prize

Prime Obsession: Bernhard Riemann and the Greatest Unsolved Problem in Mathematics, (Joseph Henry Press, 2003).

John Derbyshire

JPBM Communications Award

Steven H. Strogatz

Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student

This prize is jointly awarded by AMS, MAA, and SIAM. See page 10 for more information on the winner

Association for Women in Mathematics Prizes

AWM has two prizes that are awarded every year at the Joint Meetings. The Hay Award recognizes "outstanding achievements in any area of mathematics education, to be interpreted in the broadest possible sense." The Schafer Prize is for an undergraduate woman who has shown excellence in mathematics; the criteria considered include "the quality of the nominees' performance in mathematics courses and special programs, an exhibition of real interest in mathematics, the ability to do independent work, and, if applicable, performance in mathematical competitions."

Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman

See page 10 for more information on the winner.

Louise Hay Award for Contributions to Mathematics Education

Daniel Kane

Ana Caraiani

Virginia McShane Warfield

American Mathematical Society Prizes and Awards

The AMS's most prestigious prizes are the Leroy P. Steele Prizes, awarded every year at the Joint Mathematics Meetings. There are three Steele Prizes: one for mathematical exposition, one for a seminal contribution to research, and one for lifetime achievement. In addition, the AMS awarded the Conant Prize for the best expository paper published in either the *Notices of the AMS* or *the Bulletin of the AMS*, the E. H. Moore Research Article Prize for an outstanding research article to have appeared in one of the AMS primary research journals (this is a new prize, to be awarded every three years), the Robbins Prize for a broadly accessible paper in algebra, combinatorics, or discrete mathematics with a significant experimental component (this is a new annual prize), the Satter Prize for an outstanding research contribution by a woman, and the Veblen Prize in Geometry. Finally, the Norbert Wiener Prize in Applied Mathematics, given jointly with SIAM, recognizes an outstanding contribution to applied mathematics.

Leroy P. Steele Prize for Mathematical Exposition

David Mumford

E. H. Moore Research Article Prize

Ivan Shestakov and Ualbai Umirbaev

Leroy P. Steele Prize for Lifetime Achievement

Henry McKean
No picture available

Leroy P. Steele Prize for Seminal Contribution to Research

Karen Uhlenbeck
No picture available

Levi L. Conant Prize

Jeffrey Weeks
No picture available

Ruth Lyttle Satter Prize in Mathematics

Claire Voisin
No picture available

David P. Robbins Prize

Samuel P. Ferguson

Thomas C. Hales

Norbert Wiener Prize in Applied Mathematics (AMS and SIAM)
Craig Tracy and Harold Widom

Craig Tracy

No picture of Harold Widom available

Oswald Veblen Prize in Geometry
Peter Ozsváth and Zoltán Szabó

Peter Ozsváth

No picture available for Zoltán Szabó

Oswald Veblen Prize in Geometry
Peter Kronheimer and Tomasz Mrowka

Tomasz Mrowka and Peter Kronheimer

Winners of the Raffle to Benefit Hurricane Katrina Survivors

Mackichan Scientific Workplace (2 software prizes)
Barbara Jur
M. M. Bogacz

Four-Night stay at the San Diego Marriott during the 2008 JMM
Catherine Murphy

Dell Inspiron 1501 wireless notebook computer
Steve Hilbert

Apple IPod with color video
Carolyn Cuff

MAA $300 Bookstore Credit
Karen Bolinger

AMS $300 Bookstore Credit
Michael Barry

New England Legal Seafood Lobster Bake
Emily Moore

TI-89 Titanium Graphing Calculator
Deanna Caveny

HP 30S Scientific Calculator (5 prizes)
Michael Falk
Max Tran
Rich Neidinger
Andrew Shallue
Kimberly Vincent

Bose Tri-port Acoustic Headphones
Fred J. Hickernell

New Orleans Joint Mathematics Meetings

Just after and just before a popular talk: Escalators!

"The union must and shall be preserved." Joint Meetings Forever!

The balloon arch, pre-collapse.

See: you're in here! Don Albers shows Lee Stemkoski a brand-new copy of the January FOCUS.

Chaos in what was later going to be the exhibit hall, January 3.

No coffee, no theorems! The longest line, every morning, was at the Starbucks.
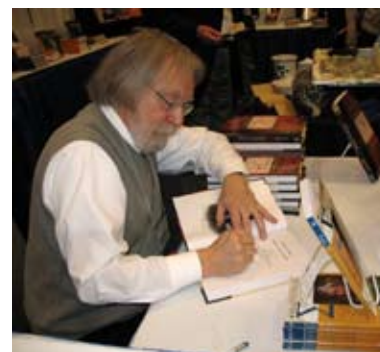
Bill Dunham signs books.

Getting ready to cut the ribbon: on the left, MAA Secretary Martha Siegel, Executive Director Tina Straley, and President Carl Cowen; on the right, AMS President Jim Arthurs, Executive Director John Ewing, and Secretary Robert Daverman.

Fight Fiercely, Harvard! John Jones of Arizona State, Ed Dunne of AMS, Fernando Gouvêa of Colby College, David Roberts of the University of Minnesota Morris.

Leon Harkleroad teaches his Minicourse on Mathematics and Music. (Photo by Colm Mulcahy)

Keith Devlin looks happy.

NExTers in feather boas!

Much of the action at the JMM occurs in the many paper sessions.

Bourbon Street at night.

Hey, isn't that MAA Development Manager Lisa Kolbe up there?

Loaded up and awaiting customers: the MAA booth before the ribbon-cutting.

No getting in until it's time: the crowd waits for the ribbon to be cut.

At the graduate student reception.

300 years old and still "the teacher of us all."

Bill Dunham, Tina Straley, and Don Albers at the launch of The Genius of Euler.

At the undergraduate student poster session.

A representative of Second Harvest prepares to choose the winning raffle tickets.

Lisa Rezac and Graeme Fairweather at the MAA/Tensor grants poster session.

Want your own icosahedron? Hans Schepker's Glass Geometry booth featured an isosahedral framework. More details at http://hansschepker.com.

A collection of Eulerians: Lee Stemkoski, Erik Tou, and Rob Bradley.

MAA staffers show off their New Orleans t-shirts. Sales benefitted Second Harvest's backpack program.

Is there a message for me? The message boards were somewhat hidden on the 4th floor of the Marriott, but people still managed to find them.

Jan van Maanen gave an MAA Invited Address on "The Bernoulli brothers in the arena of the early calculus."

At the MAA Special Session on "Entertaining with Math". (Photo by Colm Mulcahy)

A collection of MAA editors: Art Benjamin of Math Horizons, Lowell Beinecke of College Mathematics Journal, Jenny Quinn of Math Horizons, Carol Baxter (the current boss), Fernando Gouvêa of FOCUS, Dan Velleman of the Monthly.

Guess what's in the Rampart Room?

Steve Dunbar at the American Mathematics Competitions Booth.

Ron Calinger speaks on Euler's life at the MAA Short Course.

Speakers at the Euler mini-course. In back, Ed Sandifer, Janet Barnett, Rob Bradley. In front, Ron Calinger, Jeff Suzuki, Stacy Langton, Larry D'Angelo.

Scott Williams of the University of Buffalo, SUNY, gives the NAM Cox-Talbot Address. (Photo by Jaqueline Giles)
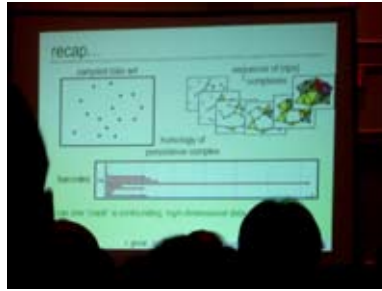
Data sets, homology, and bar codes come together in Robert Ghrist's talk at the AMS Current Events Bulletin session.

Lee Lorch and Mrs. Scott Williams at the NAM Banquet. (Photo by Jacqueline Giles)

It used to be all about books, but now software is just as important at the exhibits.
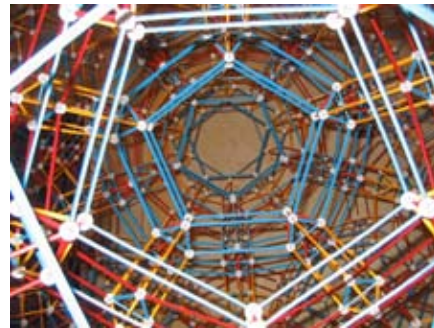
The zome polyhedron from inside. (Photo by Joe Gallian)

AWM President Barbara Keyfitz (left) and AWM Noether Lecturer Karen Vogtmann (right).

William Smith of the ASA presented the JPBM Communications Award.

What have the Presidents done to John Ewing?

Serving beignets at the Hawkes Learning Systems booth.

NExT directors.

Joe Dauben and Karen Parshall talk about being a historian of mathematics.

Michael Pearson, MAA Associate Executive Director and Director of Programs and Services, shows no respect for the camera.

Stacy Langton had one of the champion beards.

Ed Sandifer signs copies of his new book while Bill Dunham looks on.

Your turn now: MAA President Carl Cowen passes the gavel to MAA President Joe Gallian.

Harry Lucas, Jr. is Inducted into the Icosahedron Societyat the Joint Mathematics Meetings in New Orleans

By Lisa Kolbe

Harry Lucas, Jr., founder of the Educational Advancement Foundation, a philanthropic organization headquartered in Austin, Texas, was inducted into this prestigious society at the President's Reception on Sunday, January 7, 2007 during the 90th national meeting of the Mathematical Association of America in New Orleans.

It is through Mr. Lucas' incredible generosity that the Project NExT program has since 1999 supported six named Fellows known as the R.L. Moore Fellows. These Fellows are named for the renowned professor of mathematics at the University of Texas at Austin from 1920-1969, who promoted the study of more effective methods of learning and teaching. Mr. Lucas was greatly influenced by the teaching methods of R.L. Moore and subsequently launched the Legacy of R.L. Moore Project, which promotes the study of effective methods of teaching and learning at all educational levels. Mr. Lucas' support of named Fellows will increase to 8 in 2007.

The Icosahedron Society was formed in 2000 to recognize individuals, foundations, or corporations that 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, Development Manager, at 202-293-1170 or lkolbe@maa.org.

MAA President Carl Cowen congratulates Harry Lucas, Jr. (left) after his induction into the Icosahedron Society.

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 and Kaarina Sterrett

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

Year 2007
Harry Lucas, Jr.

Let's Meet Again...

MathFest 2007
August 3–5, San Jose, CA
JMM 2008
January 6–9, San Diego, CA

I had forgotten how much fun the Joint Meetings can be when you aren't interviewing for jobs!

—Darren Glass
Gettysburg College

The MAA Goes To Middle School (and How You Can Too)

By Steven R. Dunbar and Bonnie Leitch

Many MAA members participate in pre-college mathematics education: through the mathematical education of teachers, as teachers in the K–12 grades, by having children in K–12 grades, or perhaps by involvement with young learners through tutoring, math circles, or volunteering in schools. The MAA as an organization also engages K–12 mathematics education through its American Mathematics Competitions program.

For 22 consecutive years, the MAA has offered a stimulating and challenging mathematical contest program to middle schools. The contest, called the American Mathematics Contest 8, or AMC 8 for short, is the younger sibling to the well-known high school mathematics contest the MAA has sponsored since 1950. Starting as the American Junior High School Mathematics Examination, or AJHSME, in 1982, the contest changed its name to the AMC 8 in 2000. The change reflected the fact that many schools no longer called themselves junior high schools, and also fit the contest in an expanded array of contests: AMC 8 for 8th grade and below, AMC 10 for 10th grade and below, AMC 12 for 12th grade and below.

Although the AMC 8 contest focuses on students in the sixth, seventh, and eighth grades, some accelerated fourth and fifth grade students also take part. The AMC 8 is a 25-question, 40-minute multiple-choice contest with no penalty for guessing. A student's score is the number of problems correctly solved. The AMC 8 questions cover the middle school mathematics curriculum. These questions can include, but are not limited to, everyday applications of mathematics, percent, estimation, elementary probability, counting, simple number theory, reading and interpreting graphs, elementary geometry, and spatial visualization. No problem requires the use of algebra or a calculator, although students may use calculators.

The goal of the contest is to increase interest in mathematics and to develop

Students taking the November 2006 AMC 8 at Affiliated Middle School to Jilin University, Changchun City, China, photo courtesy of Dr Xiaodi Wang.

mathematical problem-solving skills through friendly, fun competition. Of course we hope that many of the students taking the contests are challenged, and maybe inspired, to learn mathematics they have not encountered before. The contest also readies middle-school students for other contests, including *Math-Counts* and the high school level AMC 10 and AMC 12. Many of the students who do well in the AMC contests find that they really enjoy mathematics so they subsequently major in mathematics, or science and engineering.

The AMC 8 contest is created by a committee of MAA members, like most mathematical productions from the MAA. The committee is a mixture of teachers with middle-school experience and college instructors with an interest in middle-school mathematics education. All have an interest in the great tradition of mathematical problem setting and solving. The committee chair solicits problems for the AMC 8 from a large group of interested MAA members each April, over a year in advance of the planned contest. A panel of reviewers rates the

problems and then the committee and the chair, acting as an editor, successively drafts, reviews, edits, and revises until a finished product is ready to send to the middle and junior high schools registered to take the contest.

The contest takes place directly in classrooms each year in November under the supervision of the local administering teacher. The schools send their answer sheets to the MAA's American Mathematics Competitions offices on the campus of the University of Nebraska-Lincoln for scoring and tabulation. About three weeks later, each school receives a detailed report on the scores along with prizes for the high-scorers in the school. The AMC gives special recognition for high scoring schools, the E. M. Sliffe awards for teachers with consistent high team scores, medals and plaques for the highest scores in each school, and special plaques and awards for the highest scores in each state. Since the AMC office tabulates all the scores, the overall statistics provide an insight about trends and what is happening mathematically in the minds of middle-school students.

The AMC office has completely tabulated the results for the 2006 AMC 8, and we can glimpse the kinds of problems that students found easy and hard this year. A total of over 147,000 students took the contest in November 2006. The participating students came from over 2200 schools. Over 68,000 female and over 76,000 male students took the contest. The participation numbers don't exactly match because some students do not mark the male/female bubble or the mark is incomplete or unreadable. Last year, every state in the United States was represented, as well as 6 Canadian provinces and 20 other countries. The largest number of participants outside North America, about 7700, were in Taiwan. The average score overall was 10.14 out of a possible 25.

The committee arranges the 25 questions with the easiest problems the first 5 or so, problems 6 through 10, a little more challenging and so on until the last 5 problems are usually answered by only the best problem-solvers. The last 2 or 3 questions are designed to be differentiators that are long enough or difficult enough to isolate a relatively small number of perfect scores on the contest. The committee and the reviewers usually do a reasonably good job of constructing the "perfect" test, but any math educator who ever wrote a test knows students never think in a predictable way.

Measuring difficulty is not as obvious as it might appear at first glance. The contest is multiple-choice, and in the end we know the percentage of students who chose the correct answer, but there is no way to know why they selected the right answer. Also, there is no penalty for guessing, so relatively few questions are left unmarked. In typical adolescent style, some answer sheets are marked by pure guessing, even doodling, making designs and patterns with the array of answer bubbles! Common or obvious mistakes are some of the answer choices provided on the contest, so some tempting distractors get marked. Perhaps the student's logic or problem-solving technique was correct, but a careless student mis-marked the answer, or passed by a problem for lack of a choice corresponding to the incorrectly worked answer. All of these

confound the measurement of what might be the hardest or easiest question in some ranking of difficulty.

Measured by the percentage of students choosing the correct answer, in 2006, Problem 1 was the easiest question. "Mindy made three purchases for $1.98, $5.04 and $9.89. What was her total to the nearest dollar?" The choices were (A) $10, (B) $15 (C) $16 (D) $17 and (E) $18. 93.95% of the students answered correctly with (D). The most popular wrong choice was (C) with 3.72%.

The hardest problem on the 2006 test, at least measured by the smallest percentage selecting the correct answer was Problem 24: "In the multiplication problem below, A, B, C, and D are different digits. What is A+B?

$$\begin{array}{r} ABA \\ \underline{\times\ CD} \\ CDCD \end{array}$$

The choices were (A) 1 (B) 2 (C) 3 (D) 4 (E) 9. Only 15.39% chose the correct answer (A), while 16.15% chose (B), 26.01% chose (C), 17.68% chose (D), 12.09% chose (E) and 12.55% omitted answering the question.

In past years, problems involving geometry have often had lower percentages of correct answers, but on the 2006 contest, this rule of thumb did not hold. Problem 6 "The letter T is formed by placing two 2 x 4 inch rectangles next to each other as shown. What is the perimeter of the T in inches?"
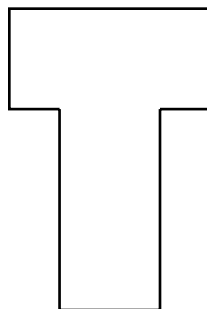
Over half of the participants, 55.10%, answered correctly with 20 inches. Problem 19, with its placement, should have been a difficult problem: "Triangle ABC is an isosceles triangle with AB = BC. Point D is the midpoint of both BC

and AE and CE is 11 units long. Triangle ABD is congruent to triangle ECD. What is the length of BD?"
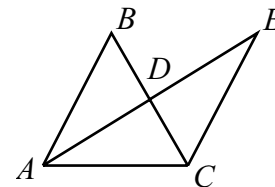
Yet almost as many, 52.37%, got it correct.

On the other hand, the committee may have been misjudged problem 7 in difficulty: "Circle X has a radius of π. Circle Y has a circumference of 8 π. Circle Z has an area of 9 π. List the circles in order from smallest to largest radius." Only 20.87% of the students got the correct ordering Z,X,Y and incorrect answer choice (A) X, Y, Z was too tempting with 38.54% of the participants selecting it.

Almost as hard as the hardest problem was problem 22, which had only 17.16% choosing the correct answer. "Three different one-digit positive integers are placed in the bottom row of cells. Numbers in adjacent cells are added and the sum is placed in the cell above them. In the second row, continue the same process to obtain a number in the top cell. What is the difference between the largest and smallest numbers possible in the top cell?"
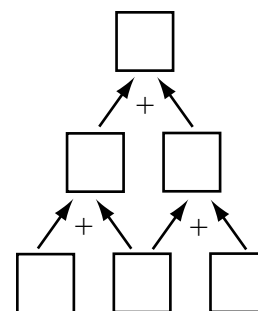
Among the choices (A) 16, (B) 24 (C) 25, (D) 26, and (E) 35, of course, (D) is the correct choice. Could you explain why to a middle-school student?

A general trend to be drawn from this

Students taking the November 2005 AMC 8 at Bernardo Heights Middle School, San Diego, CA. These students are from mixed grades 6-8, drawn from classes in prealgebra, algebra, and geometry. Photo courtesy of Vickie Bakki, BHMS GATE Coordinator.

year's contest is that participating middle school students do well with familiar kinds of arithmetic and geometry problems. About half of the students have good facility with geometry problems, but comparisons using data about area and length are still hard for students. This year the problems involving number logic and puzzles presented the most difficulties. Since the contest is created year by year and reflects the interests and tastes of the problem creators and editors, the analysis doesn't have strict statistical validity but it does suggest some tantalizing insights into middle school mathematics curricula.

The Mathematical Association of America is proposing that members become more active in mentoring both high school and middle school students. The AMC 8 contest is a perfect opportunity for any college or university to become actively involved with bright middle

school students in its area. Consider hosting the AMC 8 contest on your campus in November. Start this September by acting as a liaison between the American Mathematics Competition and middle schools in your area. The preliminary activities might be any combination of encouraging students to take the contest to subsidizing the contest for students or schools that lack the resources, a comparatively inexpensive initiative, to providing middle school teachers and their students with tutoring opportunities with local college students or professors.

On the day during the week-long AMC 8 contest window in mid-November that is most convenient for your institution, have a math field day. Students' schools will provide transportation to and from your campus and supervision. You will be responsible for administering the contest, providing a tour of your institution and after lunch directing a session with

solutions and analyses of the problems on the contest.

If the opportunity to excite young students mathematically while showcasing your institution interests you, contact the American Mathematics Competitions office at amcinfo@maa.org or 800-527-3690. If you would like to do some of your own statistical analysis or just learn more, check the AMC web pages by going to http://www.maa.org, then selecting Programs, and finally American Mathematics Competitions. If you would like to volunteer to write or review problems for the AMC 8, the AMC 10 or the AMC 12, contact us at amcinfo@maa.org.

Steve Dunbar is the Director of the AMC Program. Bonnie Leitch is chair of the MAA's AMC 8 Subcommittee.

In FOCUS: Curriculum Focal Points

Articles by Francis Fennell, Anthony Ralston, and Barbara Reynolds

As noted in our November issue, the National Council of Teachers of Mathematics (NCTM) recently released a document entitled *Curriculum Focal Points*. The document is available online at http://www.nctm.org/focalpoints/, where one can also find a lot more information and discussion, including questions and answers on the document. NCTM says the document extends the Council's leadership of more than twenty-five years by describing an approach to curriculum development that focuses on areas of emphasis within each grade from prekindergarten through grade 8. *Curriculum Focal Points*, widely reported in the news media, was hailed by some as a retreat from NCTM's previous positions. This misreading is addressed in each of the three articles that follow. We hope that they will shed some light on the goals and content of *Curriculum Focal Points*. The articles below are the opinions of the authors and do not reflect a position or stance of the MAA.

NCTM's Curriculum Focal Points

By Francis (Skip) Fennell

The publication by the National Council of Teachers of Mathematics (NCTM) of *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence* marks the Council's next step in implementing the vision set forth in the *Principles and Standards for School Mathematics (NCTM, 2000)*, with particular emphasis on curricular expectations.

The genesis of the *Curriculum Focal Points*, released on September 12, 2006, was a conference at the Park City Mathematics Institute in 2004 organized by NCTM with the Association of State Supervisors of Mathematics (ASSM). It brought together mathematicians, supervisors of mathematics, and mathematics educators with the intent to examine the K–12 mathematics standards of each of the states and how they were influenced by *Principles and Standards for School Mathematics*. The expectation was that the consistency of the findings would guide a discussion that could begin to lead to a meeting of the minds about the important mathematics that should be taught at various grades. Instead, the outcome was the discovery that there was little consistency between standards and expectations or of what content fell in what grade. Perhaps most troubling was the consequent realization that this lack of consistency was inevitably detrimental to the teaching and learning of K–12 mathematics nationwide.

An analysis of the conference findings resulted in the publication entitled "Standards and Curriculum: A View from the Nation," (NCTM, 2005). This joint report by NCTM and ASSM provides insights into where we appear to be headed in our expectations for students' mathematics learning. The report is an initial attempt to examine across states the impact of *Principles and Standards for School Mathematics* on curriculum reform, discern how state educational agencies approached the task of developing state standards, and bring to light areas of commonality and difference. The findings from this endeavor laid a foundation for discussions about the future direction of local, state, and national mathematics curricula. From this were born the idea and concept of what became the *Curriculum Focal Points*.
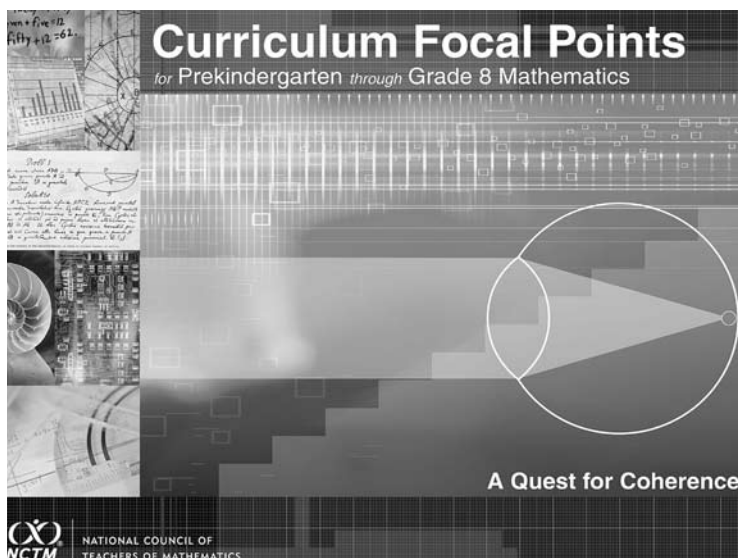
Extensive, thoughtful, and at times intensely debated discussions among a group of nine writers generated the concept and early drafts of the *Curriculum Focal Points*. The written draft of the *Curriculum Focal Points*. The written draft of the

writers, who represented expertise in mathematics and mathematics education as well as classroom experience from pre-kindergarten through grade 8, was reviewed and commented upon by some 70 reviewers, including mathematicians, mathematics educators, and policymakers. After extensive further revisions, the publication was presented to the NCTM Board of Directors, which on April 24, 2006 approved it for publication.

Curriculum focal points are important mathematical topics for each grade level. They are the related ideas, concepts, skills, and procedures that form the foundation for understanding, lasting learning, and success in higher level mathematics, beginning with algebra. NCTM views the *Curriculum Focal Points* as a framework for developing mathematics curriculum at the state and school district level. The focal points are intended to frame

discussions that will eventually inform the decisions of textbook publishers and assessment developers, as well.

The *Curriculum Focal Points* address curriculum, or *what* is taught, rather than instruction, or *how* it is taught. By design, there is no mention of instructional strategies, instructional materials, technological tools (e.g. the calculator), or manipulative materials. This was the intent of the writers of the focal points — to provide a publication that would foster discussion, dialogue, and decision-making relative to the important mathematics for pre-kindergarten through grade 8. The ultimate goal would be for these suggestions, the focal points, to lead to the development of mathematics curriculum goals that are more cohesive from grade to grade and from school to school. Through its Connections, the new publication also shows additional ways in which the focal points connect to *Principles and Standards*.

The *Curriculum Focal Points* provides an example, a critical foundation, for the next generation of curricula and related assessments. Curriculum developers can place *Curriculum Focal Points* and a local or state curriculum side by side when refining their current curricula. Curriculum developers can determine how much time to devote to the focal points as the mathematical core for a particular grade level, and then build other mathematics topics around these important areas of focus.

Media Coverage

The *Curriculum Focal Points* release was widely reported in the news media and generated considerable discussion within the mathematics and education communities. Some inaccurate coverage raised questions among many who were asking "Is what the *Wall Street Journal* and *New York Times* reported true? Is NCTM really *going back* to basics?"

In a letter sent to the *Wall Street Journal* and published on September 26, I wrote, "Contrary to the impression left in your article, learning the basics is certainly not 'new marching orders' from the NCTM, which has always considered the basic computation facts and related work with operations to be important. Nor is the

new focal-points approach to curriculum development a 'remarkable reversal' for NCTM. As stated in NCTM's 1989 and 2000 *Standards*, conceptual understanding and problem solving are absolutely fundamental to learning mathematics. The council has never promoted estimation 'rather than precise answers.' Estimation is a critical component to the overall understanding and use of numbers."

A letter to the editor of the *New York Times* published on September 24, stated, "What some refer to as basic skills (for example, multiplication facts, and fluency with the addition, subtraction, multiplication and division of whole numbers) have always been a fundamental core of elementary school mathematics. Always. But we want more. We want children to understand the mathematics they are learning and we want them to be able to solve problems, which is, in the long run, why we do mathematics."

The *Curriculum Focal Points* are in no way a reversal of the Council's long-standing position on teaching students to learn critical foundational topics (e.g. multiplication) with conceptual understanding, and they are not a retreat from *Principles and Standards for School Mathematics*. Rather, the *Curriculum Focal Points* are the next step in implementing the *Standards*. The appendix in *Curriculum Focal Points* directly links the focal points to virtually all the expectations in *Principles and Standards*.

One of the questions asked most frequently is about the standard algorithm and whether the *Curriculum Focal Points* expressly states that all students *must* learn the standard algorithm. The grade 2 focal point suggests efficient procedures, including the standard algorithm — *including*, not exclusively, access to the standard algorithm. Students should use what they can do efficiently and accurately. Most important, they should not use any algorithm until it is understood.

Similarly, for grade 4 the quick recall of multiplication facts and fluency with efficient procedures, including the standard algorithm, is a focus. Again, and importantly, fluency emerges through deep understanding of the multiplication process

— how multiplication is represented and how properties, particularly the distributive property, are used when multiplying. Students become fluent through their understanding of how and why procedures work — with a focus on place value and properties of operations.

The Purpose

Today's mathematics curricula tend to be dominated by long lists of very specific goals, standards, objectives, or learning expectations. By contrast, *Curriculum Focal Points* describes significant mathematical concepts and skills for each grade level. They are a way to organize and connect critical mathematics topics from grade to grade. Organizing a curriculum around the focal points can provide students with a more coherent ever expanding body of mathematical knowledge.

Mathematics leaders should use the *Curriculum Focal Points* to launch discussions about the next generation of curriculum standards, textbooks, and tests. Such dialogue, discussion, and debate are critical and can lead to the development of new models for curriculum, instruction, materials, and assessments. *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics* represents an important, initial step in advancing collaborative discussions about what mathematics students should know and be able to do.

For More Information

Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics is available free of charge online. To download the PDF version, visit http://www. nctm.org/focalpoints/downloads.asp. The *Curriculum Focal Points* publication can be purchased through NCTM's online catalog at http://www.nctm.org/catalog, or by calling (800) 235-7566.

Francis (Skip) Fennell is President of the National Council of Teachers of Mathematics and Professor of Education at McDaniel College in Westminster, MD. Fennell likes the number 7. It represents the current number of grandchildren and marathons completed. He hopes to expand one of these numbers to the very nice number ten–within a few years.

Focus on Focal Points:

A Commentary on the NCTM Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics

By Anthony Ralston

In 1989 and 2000, the NCTM (National Council of Teachers of Mathematics) published two reports, *Curriculum and Evaluation Standards for School Mathematics* (hereafter the *Standards*) [1] and *Principles and Standards for School Mathematics* (hereafter *PSSM*) [2] on standards for school mathematics. The first of these, at least, was very important in influencing school mathematics curricula, but both — although the second less so — have been rubbished by some mathematicians, mostly research mathematicians, many of whom act — and write — as if NCTM were The Great Satan of mathematics education.

But now with the publication under review here there is (almost) universal praise from the most zealous of the traditional (as opposed to reform) Math Warriors (hereafter TMWs). "Traditional" is not actually a well-defined term in math education. Here, by "traditional" math warriors I mean those who generally support the back-to-basics approach exemplified by the current California math standards.

The TMWs praise the new publication even though the NCTM makes clear that *Curriculum Focal Points* (hereafter *CFP*: available online at http://www.nctm.org/focalpoints/, which also includes a question-and-answer page and lots of other information about *CFP*) builds on and is closely tied to *PSSM*. Phrases such as "an end to the math wars" or "it's about time" for this "role reversal" now roll off the lips of prominent TMWs. How can this be? If the NCTM was as hopeless as it had been portrayed and if *CFP* only builds on previously denigrated NCTM publications, how can there now be such praise for its latest work? Read on!

Rules of Engagement

If you wish to produce a document on a controversial subject that will be praised or, at least, not damned by any side, the first rule is: *Keep it short*. If you do, there will be much less text to shoot at. The *Standards* at 258 pages and *PSSM* at 402 pages were full of detail that could be castigated by those so inclined.

Avoiding the trap of the *Standards* and *PSSM*, the authors of *CFP* have obeyed this rule admirably. Not counting the boilerplate at the front, *CFP* is 41 pages short. Of these, 20 pages are an Appendix that relates the *Focal Points* to *PSSM*. Nicely color-coded for ease of use, this Appendix may, indeed, be valuable to curriculum developers but it is just what it claims to be: an appendix. The Appendix is followed by one page of references. Ten of the remaining pages are introductory material explaining the motivation of *CFP* and explaining what *Focal Points* are, how they should be used, and how they relate generally to *PSSM*. These do contain the most telling indication that NCTM's approach has not changed:

"[*CFP*] assumes that the mathematical processes described in *Principles and Standards* will be implemented in instruction that requires students to discuss and validate their mathematical thinking; create and analyze a variety of representations that illuminate the connections within the mathematics; and apply the mathematics that they are learning in solving problems, judging claims, and making decisions."

The guts of *CFP,* however, are contained in 10 other pages, one each for the ten grades from Prekindergarten to Grade 8, each of which contains the focal points for that grade.

A second rule is this: *Wherever possible, be ambiguous*. Then just about everyone can interpret what you have written as supporting his or her perspective. *CFP* abounds with language subject to whatever interpretation the reader might wish to put on it.

Take, for example, "fluency" (as in "fluency with multidigit addition and subtraction") which appears 25 times — whereas "proficiency" appears only once in the entire document, and that in the introductory pages. Fluency is the kind of word that can be interpreted as mastery by those who want a back-to-basics approach to mathematics but as meaning only that students can deal with numbers flexibly and efficiently by those who wish to avoid the "drill and kill" instruction of the past. Is this just a quibble? I think not. *CFP* says in three places that "students should develop fluency with efficient procedures, including the standard algorithm." Clear enough, isn't it? When studying division, this surely implies that the student should learn the standard algorithm for long division. But not quite. When queried about this, NCTM responded that "including" means that the standard algorithm should be one of the available options, but that it need not, in fact, be taught to all students.

Throughout *CFP* the language has been very carefully chosen so as not to upset any of the most vocal traditionalists who were so critical of the *Standards* and *PSSM*. (Full disclosure: I have been a peripheral warrior in the Math Wars but hardly a neutral one. I am totally unsympathetic to the traditionalists whom, I believe, have utterly failed to grasp how mathematics education needs to adapt to a world where calculators and computers are ubiquitous. But neither am I a fan of the so-called reform curricula that are generally much too timid in proposing changes in school mathematics.)

The C-word

Well, there I've done it by using just the word the TMWs feel so strongly about, namely "calculators." It is particularly noteworthy that the word "calculators(s)" appears nowhere — I repeat, *nowhere* — in *CFP*. (Well, not quite; "calculator" appears in four places in the Appendix but in each instance only as a reference to *PSSM*.) How can this be at a time when whether or how much students use

calculators in elementary school arithmetic is one of the most, perhaps the most controversial issue in elementary school mathematics education? The authors of *CFP* would, I think, answer this question by pointing to the section in *CFP* on "How Should Curriculum Focal Points Be Used" where they say

> Its [*CFP*'s] presentations of the focal points include neither suggestions for tools to use in teaching nor recommendations for professional development in content or pedagogy.

Thus, we won't discuss calculators because we aren't giving any "suggestions for tools." On the other hand there are five references to those other tools, "pencil-and-paper." The fact is that one just cannot speak or write persuasively about the elementary school mathematics curriculum in the 21st century without dealing with the issue of whether and, if so, when calculators should be used in teaching that curriculum.

CFP does, at least, pay lip service to the benefits of mental calculation, which is mentioned four times. Three of these are in the context of estimating sums, differences, products or quotients or calculating them mentally "depending on the context and the numbers involved," making it clear that little more than knowledge of the addition and multiplication tables is expected here. (Am I wrong? Perhaps; but if so, this is another example of purposeful ambiguity.) The fourth instance advocates the building of "facility with mental computation" to do "addition and subtraction in special cases such as 2,500 + 6,000 and 9,000 – 5,000". While I applaud any mention of mental arithmetic, *CFP* essentially trivializes what students may accomplish in this domain.

The absence of even the word "calculator" is the most important reason why *CFP* has been so widely praised by NCTM's heretofore opponents. But the refusal even to discuss the crucial issue of calculators means that anyone using *CFP* for curriculum development has no guidance whatever on how much or how little use of calculators to build into a curriculum.

Fuzzy Math

The paeans of joy in the American press (e.g., *the Wall Street Journal* [3], *the New York Times* [4], *The New York Sun* [5], *The Washington Times* [6], *The Jewish World Review* [7], and probably elsewhere also) all praised the retreat of NCTM from the "fuzzy math" of the *Standards* and *PSSM*. What is "fuzzy math?" It is, as I have written elsewhere [8], "a fuzzy concept meaning whatever the critics of new [i.e., reform] curricula want it to mean at a given time." Sometimes it refers to those [mythical] people who wish to favor inexact rather than exact answers. At other times it refers to anyone who favors "constructivist math" [5] (whatever that may be).

In fact, the canard that NCTM ever favored fuzzy math, however you might define it, has never been true; it is, indeed, a lie which is repeated endlessly without any evidence whatsoever in the hope that if you repeat a lie often enough, people will believe it. I know of no one in NCTM or the math education community generally who has ever espoused teaching children that exact answers are not important and always to be desired, when they can be obtained with reasonable effort. Nor does any math educator doubt that instant recall of the addition and multiplication tables is necessary for anyone studying arithmetic.

At least, *CFP*, like the *Standards* and *PSSM* before it, does stress the value of being able to estimate, not as a way to avoid calculating exact answers but rather when an estimate is all that is required or to enable checking the reasonableness of answers on a calculator. Indeed, any good contemporary elementary school mathematics curriculum must emphasize the value of being able to estimate answers.

The Math Wars

Various comments about *CFP* ([3], [9]) have expressed the belief or hope that its publication would bring an end to the Math Wars that for years now have roiled the US math education scene. On one side have been the TMWs, the most vocal of whom are research mathematicians, but which also include parents, business groups and some teachers. On the other side are the RMWs (reform math warriors) whose leaders are mainly math educators but with significant support from parents and teachers.

Indeed, viewed as the authors of *CFP* state they intended, namely as an extension of the *Standards* and *PSSM, CFP* resolves none of the issues in the Math Wars. Moreover, despite the response of TMWs to *CFP* and the prior publication of the *Common Ground* report [10], none of the really significant issues in the Math Wars have been resolved nor can they be in any foreseeable future.

Briefly stated, at the elementary school level, these issues revolve around the question of whether arithmetic should focus on attaining proficiency with the classical pencil-and-paper algorithms for the four arithmetic functions or whether the elementary school curriculum should embrace the wide use of calculators in teaching arithmetic to achieve sound understanding of arithmetic itself as well as to prepare students as well as possible for the further study of mathematics. There are similar issues with respect to middle school and secondary school mathematics but most of the heat in the Math Wars has been focused on the elementary school curriculum.

These issues are nowhere near being resolved. While we should all applaud any attempt to achieve a debate more civilized than at some times in the past, publications like the *Common Ground* report and now *CFP* merely fudge the important issues. But resolution of the arguments in the Math Wars, not fudging, is crucial to the future of American — but not just American — school mathematics. My own view is that the main controversies in the Math Wars will not be definitively settled for many years until, at least, the main protagonists have long since left the field of battle. In the meantime, it is important that those who feel strongly about the reform mathematics agenda fight for their beliefs with undiminished intensity and without propitiation of their antagonists.

The Real Issue

Sadly, however, despite my strong belief in the need to reform American school

mathematics, neither the success nor failure of this reform will have much effect on American mathematics education for the foreseeable future. The real tragedy of mathematics education in American schools is the declining number of first-class mathematics teachers (and the growing number of uncredentialled teachers) in secondary schools and the growing number of mathematics-averse teachers in elementary schools. Nothing in the *No Child Left Behind Act* (NCLB) will reverse this trend. Indeed, the opposite is much more likely with NCLB already beginning to prove that act most destructive of good education ever passed by the United States Congress.

This is not the place to discuss why teaching, particularly mathematics teaching, is failing to attract the best and the brightest that we need in American schools (but see [11]). Nor is it the place to discuss the disaster that the testing regimen in NCLB is wreaking on American schools. But until the teaching profession does start to attract large numbers of the best and the brightest, a publication like *CFP*, whatever you think of it, cannot

possibly contribute much to improve the state of American school mathematics education.

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Tony Ralston, who currently lives in London, is Professor Emeritus of Computer Science and Mathematics at SUNY at Buffalo. He has been interested in mathematics education for many years.

What are the Curriculum Focal Points? ... And Why Should We Care?

By Barbara Reynolds

What are the *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics: A Quest for Coherence* (National Council of Teachers of Mathematics, 2006)? Why should they matter to me? Why should they matter to the mathematics community?

In 2000 the NCTM released the *Principles and Standards for School Mathematics*, a comprehensive document that built on a bold vision that had been set by *An Agenda for Action* (NCTM 1980) and expanded in a set of *Curriculum and Evaluation Standards for School Mathematics* (NCTM 1989). The *Principles and Standards* sets a challenging comprehensive program, outlining goals that are both broad and deep. Now just six years later, the NCTM has presented us with *Curriculum Focal Points*. Does this new document represent a change in direction, a strengthening of the guidelines laid out in the *Principles and Standards,* or (as some might fear) a watering down of the content of the school mathematics curriculum?

When it first came out, I studied the *Principles and Standards* rather thoroughly, and was excited by its comprehensive vision. If students coming into college and university mathematics courses were educated according to the goals outlined in the *Principles and Standards,* if they came into college mathematics courses with the depth and breadth of understanding proposed in the *Principles and Standards*, wouldn't our job as teachers of undergraduate mathematics be so much easier!

My fear as I began to read the *Curriculum Focal Points* was that I would find a simplified list of competencies, grade-level mastery objectives, and testable outcomes — after all, this is the world of No Child Left Behind (NCLB) — that might represent minimal goals for each grade level of the school mathematics curriculum. My fear was that the *Curriculum Focal Points* would set minimal goals that would undermine the bold vision set by the *Principles and Standards*. Would the NCTM sell out to NCLB?

Instead what I see in the *Curriculum Focal Points* is a balanced set of guidelines that shows one way of developing a pre-kindergarten through grade 8 mathematics curriculum, guidelines that give focus to one or another area of the objectives set by the *Principles and Standards* at each grade level, while illustrating ways of making connections to the overall fabric of mathematics throughout the entire pre-kindergarten through grade 8 mathematics experience of school children.

The *Curriculum Focal Points* are not presented as a curriculum in and of themselves, nor are they presented as a set of lesson plans. Rather they are presented as guidelines for developing an integrated pre-kindergarten through grade 8 mathematics curriculum. These *Curriculum Focal Points* illustrate one way of making explicit connections both to topics that the child studied in the preceding years, and to content that will be coming in subsequent years.

Curriculum developers and textbook writers could use these *Curriculum Focal Points* as an organizing outline — focal points, actually — to develop mathematics programs that will be integrated and connected across grade levels. Classroom teachers would then be in a position to present mathematics at each grade level that implements the broad vision set by the *Principles and Standards*, and builds coherently from year to year. The *Curriculum Focal Points* make it more likely that classroom teachers will have well-designed materials that follow the bold vision set by the *Principles and Standards*, and that allow them to develop problem solving, reasoning, and critical thinking skills in their students without sacrificing computational skill development.

I began this reflection by asking why these *Curriculum Focal Points* should matter to me. Why should they matter to those of us who teach undergraduate mathematics? After all, students coming into our undergraduate mathematics classrooms are four or more years beyond Grade 8. What impact might these *Curriculum Focal Points* have on my own teaching of undergraduate mathematics?

The *Curriculum Focal Points* could impact my own teaching in two ways: First of all, if more schools adopt school mathematics materials that implement the vision of the *Principles and Standards*, classroom teachers will need to have a deep and broad understanding of mathematics. Classroom teachers will need an understanding of mathematics that goes well beyond computational fluency and that encompasses deeper mathematical reasoning and problem-solving skills. So we need to think about how to better prepare pre-service teachers, and we need to think about on-going professional development of in-service teachers.

Secondly, if the calculus reform movement of the 1980s taught us anything, we must be aware that as school curriculum implements the bold vision expressed in the *Principles and Standards* — something that will be facilitated by the guidelines set out by the *Curriculum Focal Points* — we can expect that in four to six years we will be seeing more students whose school mathematics programs implemented this bold vision coming into our own undergraduate mathematics classes. Will we be ready for such students?

Barbara Reynolds, SDS, is professor of Mathematics and Computer Science at Cardinal Stritch University in Milwaukee, WI. She has a passion for teaching for understanding.

Call For Papers
Contributed Paper Session at MathFest 2007

The Mathematical Association of America will hold its eighty-fifth summer meeting, Friday, August 3, through Sunday, August 5 in San Jose, California.

The complete meetings program will appear in the April 2007 issue of FOCUS. This announcement is designed to alert participants about contributed paper sessions and their deadlines. Please note that the days scheduled for these sessions remains tentative.

The organizers listed below, solicit contributed papers pertinent to their sessions. Sessions generally limit presentations to ten or fifteen minutes. Each session room will be equipped with a standard overhead projector, an LCD projector (presenters must provide their own laptops), and two screens.

Submission Procedures for Contributed Paper Proposals

To submit an abstract for MathFest 2007, go to http://abstracts.maa.org. The instructions should be straightforward. You will have the option to save a draft of your abstract and return later to edit/complete and submit it, or submit it immediately. Once the abstract has been submitted, you will not be able to edit it later, but you will be able to log into the site at any time to preview your submitted abstract. The MAA will publish abstracts for the talks in the contributed paper sessions.

An abstract should not be submitted to more than one session. Participants may speak in at most two MAA contributed paper sessions. If your paper cannot be accommodated in the session for which it was submitted, unless you indicate otherwise, it will be automatically considered for the general contributed paper session. In scheduling talks in the general contributed paper session, preference will be given to authors who have not had a paper accepted in another session. Speakers will be limited to at most one presentation in any given session. Abstracts must reach the MAA by Tuesday, May 22, 2007. Early submissions are encouraged.

Contributed Paper Sessions

Attracting and Retaining Students to Mathematics Programs via Outreach
Friday morning
The migration away from the science, technology, engineering and mathematics (STEM) fields starts in middle school and continues until the undergraduate years. We risk our nation's leadership role in the high technology society we have developed if the declining college enrollments in STEM subjects remain unchecked. This session seeks to highlight innovative outreach programs from the higher education institutes to stir interest in mathematics as well as STEM fields and innovative programs to retain students in mathematics programs. The presenters may illustrate
• Summer or year around programs with middle schools
• Summer or year around programs for high schools
• Bridge programs
• Retention programs in the higher education for currently enrolled students
It is hoped that presenters will include the impact of the programs measured by the statistical data.

Sangeeta Gad
University of Houston-Downtown

Mathematics of Sports and Games
Friday morning
The world of sports provides numerous applications that can enliven many mathematics courses, including but not limited to probability, statistics and discrete mathematics. Likewise, many examples exist in various games. The session is seeking applications in board games, card games and quiz shows, among others. Papers that show a connection between mathematics and any of these fields are welcome.

Howard Lewis Penn
United States Naval Academy
E. Lee May, Salisbury University

Emerging Technologies for Mathematics Teaching
Friday afternoon
This session will focus on innovative ways to incorporate emerging technologies into undergraduate mathematics instruction and invites papers that describe implementations and/or assessments of implementations of technologies that were not originally designed or intended for educational purposes. Examples of such technologies include but are not limited to, iPods and other MP3 devices, digital cameras, PDAs, Pocket PCs, or GPS receivers. Speaker proposals should describe at least two of the following: (1) how an emerging technology was implemented into mathematics instruction; (2) the effect of the technology on student learning and/or attitudes toward mathematics; (3) lessons learned in the implementations; (4) assessment strategies for emerging technologies. The session is sponsored by the Committee on Technologies in Mathematics Education (CTiME).

Lila F. Roberts
Georgia College & State University
Amy F. Kelley
Georgia College & State University

Current Issues in Mathematics Education
Friday afternoon
This session invites papers dealing with issues in mathematics education courses for pre-service and in-service teachers at the elementary, middle school and secondary levels. Topics of interest might include: new or nonstandard courses; online courses or activities; community involvement variations such as service learning or online tutoring; alignment of courses to national or state standards; interactions with local universities and/or school districts; courses for master's of arts in teaching programs; grants to support mathematics education programs. In particular, we welcome reports on evaluation and assessment of teacher training programs. It is hoped that a wide variety of presentations will provide interest in topics related to mathematics education.

Carol Vobach
University of Houston-Downtown

Nancy Leveille
University of Houston-Downtown

Innovative Ideas for Teaching Concepts in an Introductory Statistics Course
Friday afternoon

An ever-increasing number of college students are taking introductory statistics courses, and the number of high school students taking Advanced Placement Statistics has been growing at a steady rate. Many of these students have minimal background in statistical concepts.

• What innovative ideas have been found to enhance learning among these students?

• Statistical software and hand-held technology can present graphical displays but how are they best utilized?

• Simulations can provide useful insights or they might be viewed as hands-on activities that make the class "fun" but do not broaden understanding.

• Journal articles recommend using data drawn from today's newspaper but what criteria should be used in selecting topical data for analysis?

This session invites papers that highlight innovative ideas that have been effective as well as caveats resulting from those that produced less-than-glowing outcomes. All ideas, activities, and methods should be immediately useful to one teaching Advanced Placement Statistics at a high school or to one teaching an introductory statistics course at a two-year or four-year college or at a university. The session is sponsored by the MAA SIGMAA on Statistical Education.

Murray H. Siegel
Governor's School for Science & Mathematics, Hartsville, South Carolina

Biomathematics in the First Two Years
Saturday morning

Reports including *BIO 2010: Transforming Undergraduate Education for Future Research Biologists* (National Research Council, 2003) and *Math and BIO 2010: Linking Undergraduate Disciplines* (L. A. Steen, ed., MAA, 2005) emphasize that aspects of biological research are becoming more quantitative and that there are needs to introduce life science students to a greater array of mathematical and computational techniques and to integrate mathematics and biological content at the undergraduate level. This session is designed to highlight successful implementations of biomathematics courses or modules designed for students during their first two years of undergraduate study, efforts to recruit students into biomathematics courses, involvement of these students in biomathematics research, and assessment of how these courses and activities impact the students. Topics may include issues related to the design of biomathematics courses, integration of biology into existing mathematics courses, collaborations between mathematicians and biologists that have led to new courses, modules, or undergraduate research projects, collaborations between two-year and four-year institutions, effective use of technology in introductory biomathematics courses, and assessment issues. We seek presenters from two-year institutions, liberal arts colleges, and universities of all sizes. We encourage submissions from teams of mathematicians and biologists. The session is sponsored by the MAA SIGMAA on Computational and Mathematical Biology.

Timothy D. Comar
Benedictine University

Graph Theory and Applications
Saturday morning

This is a standard graph theory session. Graph theory provides mathematical abstraction of situations that can model pairwise relations between objects. Some of the topics of interest are counting problems, coloring problems, topological problems, distance in graphs, labeling, oriented graphs, algorithms, trees, as well as applications to related fields. In the context of this theme, we solicit original contributions in all relevant areas of graph theory, including but not limited to: graph coloring, route problems, covering problems, optimization of network flows and transportation, domination in graphs and digraphs, algebraic graph theory, Ramsey theory, spectral graph theory, and complexity.

Ralucca Michelle Gera
Naval Postgraduate School
Richard M. Low
San Jose State University

Getting Students to Discuss and to Write about Mathematics
Saturday afternoon

This session invites papers about assignments and projects that require students to communicate mathematics through oral presentations, classroom discussions and writing. These assignments/projects can come from any area of mathematics including courses for mathematics or related majors, mathematics service courses or mathematics education courses. Each presenter is encouraged to discuss how the use of the assignment/project helped students to improve their understanding of mathematics, their communication of mathematics, and their attitude toward mathematics. Of particular interest are innovative implementations of such assignments/projects including peer review of student writing or presentations, using mathematical writing or presentations as part of service learning, rubrics for assessing student writing and presentations, using student writing or oral presentations as part of program assessment, and programs to help students improve written and oral communication of mathematics.

Murphy Waggoner, Simpson College

Mathematics and the Arts
Saturday afternoon

This session invites presentations of results on the connections between mathematics and the arts: from geometry to origami to group theory on quilts, from perspective in paintings to patterns and plane tilings, from music to maps, stitching to symmetries, tessellations to textual analysis, weaving fabrics to fashioning words, dance to decorative arts, theater and film to theorems and fractals, beadwork to baskets to batiks to Bessel functions, architecture to academic applications of the arts in algebra. We invite explorations of old and new connections, from ancient Islamic tilings to contemporary folk arts to sculptures of mathematical structures, as well as the use of new technologies to illustrate links between mathematics and the various arts. Mathematical concepts inform artistic presentation, while artistic presentation can illuminate mathematics. New technologies often provide new possibilities. Altogether, new approaches, new tools, and new looks at old examples

provide new opportunities for working with and teaching mathematics, as well as providing modes of outreach to the general public about the often under-appreciated place of mathematics in relation to the arts, culture, and society. The session is sponsored by the MAA SIGMAA on Mathematics and the Arts.

Douglas E. Norton
Villanova University

Fun and Innovative Teaching Techniques for an Abstract Algebra Class
Saturday afternoon
Abstract algebra is, in many cases, one of the first "rigorous proofs" courses that an undergraduate student will take. As a result, students are sometimes intimidated by this course and find it difficult to make the transition from computational mathematics to abstract mathematics. This session will focus on fun and innovative ways of teaching some of the topics covered in an abstract algebra course. This session is a follow-up to our very well-received session of the same title at MathFest.

Sharon Clarke, Pepperdine University
Andrew Hetzel, Tennessee Tech University

Teaching Calculus in High School: Ideas that Work
Sunday morning
Most mathematics majors now have the opportunity to take their introductory calculus course while in high school. SIGMAA TAHSM is committed to assisting teachers in making the mathematical experiences of their students as challenging and exciting as possible. This session will serve as a forum in which to share activities and approaches to teaching calculus that work well with high school students. Of particular interest are projects and investigations, activities, demonstrations, teaching strategies and techniques that bring the class and the mathematics to life for the students. The session is sponsored by the MAA SIGMAA on Teaching Advanced High School Mathematics.

Dan Teague, North Carolina School of Science and Mathematics
Susan Schwartz Wildstrom, Walt Whitman High School

Student Research in Industrial Mathematics
Sunday morning
In recent years, several colleges and universities have started programs to give students the opportunity to do research on problems in the mathematical sciences coming from industry, government agencies, and businesses. In this session, we invite faculty and students to describe their experiences with student industrial research at a variety of institutions. Specifically, we invite presentations from (1) faculty, describing what it is like to supervise student industrial research, especially research done by teams of students, and (2) students, describing how industrial research programs changed their view of mathematics and affected their mathematical careers. (Please note that student presentations on their actual research should instead be submitted to the contributed paper session on student research).

Bem Cayco, San Jose State University
Tim Hsu, San Jose State University

Challenges and Successful Strategies in Teaching a Numerical Analysis Course
Sunday morning
Teaching a numerical analysis course is a challenge. Students taking numerical analysis usually have a variety of majors, backgrounds and levels of preparation prior to the course. Moreover, students coming to the course have varying expectations and interests. Faced with these challenges, the instructor seeks teaching strategies that motivate student learning, benefit all students attending the course, and enrich student knowledge of both mathematics and computations. The session invites presentations on all aspects of teaching numerical analysis: challenges, strategies, projects, demonstrations, innovative techniques, and fun activities.

Olga Brezhneva
Miami University, Ohio

Teaching a History of Mathematics Course
Sunday afternoon
More and more college mathematics teachers with little or no background in the history of mathematics are being asked to teach a history of mathematics course. This contributed papers session presents ideas for developing and teaching a history of mathematics course. We encourage discussion of courses aimed at all levels as well as general and topic specific courses. This session is a follow up to a session held at the JMM in 2004. The session is sponsored by the MAA SIGMAA on the History of Mathematics.

Joel Haack
University of Northern Iowa
Amy Shell-Gellasch
Pacific Lutheran University

Advances in Recreational Mathematics
Sunday afternoon
There have been many recent advances in recreational mathematics. For the purposes of this session, the definition of recreational mathematics will be a broad one. The primary guideline used to determine suitability of a paper will be the understandability of the mathematics. For example, if the mathematics in the paper is commonly found in graduate programs, then it would probably be considered unacceptable. Novel applications as well as new approaches to old problems are welcome. Solutions using computers are also welcome. Examples of use of the material in the undergraduate classroom are encouraged.

Paul R. Coe, Dominican University
Kristen Schemmerhorm
Dominican University

General Contributed Paper Sessions
Friday, Saturday, and Sunday mornings and afternoons
Papers may be presented on any mathematically related topic. This session is designed for papers that do not fit into one of the other sessions. Papers that fit in into one of the other sessions should be sent to that organizer, not to this session.

Sarah J. Mabrouk
Framingham State College

Employment Opportunities

ALABAMA

University of Alabama in Huntsville
The Department of Mathematical Sciences at the University of Alabama in Huntsville invites applications for a visiting position at the rank of Assistant Professor/Associate Professor, beginning August 2007. A Ph.D. degree in mathematics or applied mathematics is required. Applicants must show evidence of excellent research potential in an area that matches the interests of the department. Applicants must also have a strong commitment to teaching and show evidence of excellent teaching ability. Preference will be given to applicants whose research area is partial differential equations, mathematical modeling, or mathematical biology.

Applicants should send a curriculum vita with the AMS standard cover sheet and three letters of recommendation (with at least one letter addressing teaching) to Chairman

Department of Mathematical Sciences
University of Alabama in Huntsville
Huntsville, AL 35899.

For more information about the department, visit our web site at http://www.math.uah.edu.

Review of applicants will begin March 1, 2007, and will continue until the position is filled. Women and minorities are encouraged to apply. The University of Alabama in Huntsville is an Affirmative Action, Equal Opportunity Institution.

INDIANA

Indiana University-Purdue University Indianapolis
The IUPUI Department of Mathematical Sciences invites applications for position of Director of Mathematics Assistance Center (MAC). The Director will oversee the entire operation of the MAC, leading and managing the further development of the MAC's programs designed to support tutoring, mentoring and a variety of supplemental instruction for mathematics coursework. Minimum qualifications include a Master's degree in Mathematics or related area with proven mathematics teaching experience of at least three years at the college level. For more detailed information about this position and the application process, see http://www.math.iupui.edu/news/employment/. IUPUI is an EEO/AA Employer, M/F/D.

KANSAS

Washburn University
Mathematics and Statistics Faculty Positions
Washburn University's Department of Mathematics and Statistics invites applications for a tenure-track Assistant Professor and a full-time Lecturer beginning August 2007. **Requirements**: Assistant Professor doctorate in mathematical sciences required by time of appointment; Lecturer Master's degree in mathematics or related field; must demonstrate strong teaching credentials and potential for scholarly activities; interest in directing undergraduate research projects essential as Washburn supports a very active chapter of national mathematics honor society Kappa Mu Epsilon. Area of specialization open with preference given to candidates interested in teaching broad range of undergraduate mathematics courses. **Responsibilities**: normally teach twelve credit hours per semester including upper/lower division mathematics courses. Send current vita, statement of teaching philosophy, transcripts, names/addresses/phone numbers of three references to: Dr. Kevin Charlwood, Chair of Search Committee, Department of Mathematics and Statistics, Washburn University, 1700 SW College Avenue, Topeka, KS 66621. Application review begins January 20, 2007 and continues until positions are filled. Washburn University is an EOE. www.washburn.edu

MICHIGAN

Grand Valley State University
Grand Valley State University, an Affirmative Action/Equal Opportunity Institution in Allendale, Michigan, is accepting applications for the position of Postdoctoral Teaching Fellow in Mathematics, with employment to begin in August 2007. Candidates from groups underrepresented in mathematics are especially encouraged to apply.

Required qualifications include a doctorate in the Mathematical Sciences or Mathematics Education by August 2007, completed no earlier than May 2004; demonstrated interest in teaching undergraduate mathematics or mathematics education; and commitment to continued scholarly and professional growth.

For more information, including responsibilities of the position and important details on how to apply, see our position description at **www.gvsu.edu/math/jobs.html** Review of applications will begin on February 9, 2007 and continue until the position is filled or the search is closed. Recruitment for this position is subject to the availability of funding.

Discover a new crossword game with sufficient combinatorial possibilities to intrigue a mathematician. Visit www.wildwords.us

PENNSYLVANIA

Franklin & Marshall College
FREE MATHEMATICS AND ART WORKSHOP! Learn from experienced instructors how to blend Math & Art in your classes at Viewpoints 2007, June 10-15, Franklin & Marshall College. The Viewpoints workshops are sponsored by the National Science Foundation. Registration, art supplies, meals, and lodging are all free. Visit php.indiana.edu/~mathart/viewpoints, or contact Dr. Annalisa Crannell, Dept. of Mathematics, Franklin & Marshall College, Lancaster, PA 17603, (717) 291-4222, annalisa.crannell@fandm.edu .

The Pennsylvania State University at Harrisburg
Faculty Positions in Mathematical Sciences
The Pennsylvania State University at Harrisburg (PSH), School of Science SSET, Engineering and Technology (SSET) invites applications for multiple tenure track Assistant Professor positions in the Mathematical Sciences for Fall 2007. All positions require a Ph.D. in Mathematics, Mathematics Education, or Statistics. Candidates with expertise in Statistics, Applied Mathematics, Operations Research, Mathematical Modeling, or Mathematics Education will be given special consideration, but persons with other areas of specialization will be considered. Successful candidates will teach a broad range of undergraduate mathematics courses, including service courses, for a growing department. Graduate students in Computer Science and Engineering will make up part of the population of the higher-level courses. There are regular opportunities for the Mathematical Sciences Faculty to guide research projects for graduate students in Computer Science and Engineering. An active personal research agenda is required. All faculty members are expected to advise students

and to provide service to the College and to the University. Professional service to the community is encouraged. Information about the College and the Department can be found at www.hbg.psu.edu and at math.hbg.psu.edu.

PSH, with an enrollment of approximately 3,800 students, is a four-year undergraduate and graduate college in the Penn State University's 24-campus system. SSET, one of the five academic schools within PSH, offers undergraduate and graduate degree programs in science, engineering, and engineering technology. PSH is located eight miles from the state capitol at Harrisburg. This unique metropolitan campus serves the citizens of south central Pennsylvania and is easily accessible via interstate routes from Philadelphia, Baltimore, Washington D.C. and New York. PSH offers students the opportunity to earn baccalaureate degrees in twenty-seven academic majors, seventeen master's degree programs, and two doctoral degree programs.

Please send a letter of application, curriculum vitae (including teaching and research statements), and the names and addresses of at least three references to, Mathematics Search Committee, c/o Mrs. Dorothy J. Guy, Manager of Human Resources, Penn State Capital College, P.O. Box FOCUS, 777 W. Harrisburg Pike, Middletown, PA 17057-4898. Review of applications will begin immediately and continue until the position is filled. The Pennsylvania State University is committed to affirmative action, equal opportunity, and the diversity of its workforce.

WEST VIRGINIA

Shepherd University
The Department of Computer Science, Mathematics and Engineering at Shepherd University invites applications for a three year visiting position in the field of Applied Mathematics starting from fall 2007. Teaching responsibilities include a variety of courses in Mathematics and Engineering. Ph.D. in Applied Mathematics, with background and research interest in industrial mathematics and engineering is preferred.

The department has recently approved an Industrial Mathematics majors and is in the process of designing a new degree program in Engineering Science; both comprised of courses from Mathematics, Engineering and Physics. We are looking for an energet-

ic individual who can interact closely with students, engage in undergraduate research, is willing to be involved with public school mathematics programs, and can be an inspiration to students interested in mathematics. Salary is commensurate with experience. Send letter of application, curriculum vitae, transcripts, and at least three letters of reference to Office of Human Resources, P.O. Box 3210, Shepherd University, Shep-

herdstown, WV 25443. Please reference position number in letter of application. AA/EOE.

The Mathematical Association of America
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Washington, DC 20036

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