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MAA FOCUS

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On the cover is a composite image based on the "picture of E_8" provided in the American Institute of Mathematics press release and the titles of some of the newspapers in which the story ran. See page 4 for the full story.

MAA FOCUS Deadlines

	May/June	August/September	October
Editorial Copy	March 10	July 8	August 1
Display Ads	March 10	July 10	August 1
Employment Ads	March 24	June 11	August 13

Hard Problems Debuts in San Diego

By Ryan Miller

When MAA President Joe Gallian approached filmmaker George Paul Csicsery with a proposal to create a documentary about the students who made up the U.S. team at the International Mathematical Olympiad, following them through the rigors of the world's toughest math competition, Csicsery became fascinated with the possibilities. The result is the feature-length documentary *Hard Problems: The Road to the World's Toughest Math Contest*, which had its debut at the Joint Mathematics Meetings in San Diego on Tuesday, January 8.

Ryan Ko and Kevin Modzelewski work together on a problem during the Hard Problems *film. Photograph courtesy George Csicsery.*

Some ot the team analyzes the test after day two. Photograph courtesy George Csicsery.

Gallian's idea was to create a documentary similar in style to *Spellbound*, the 2002 film that chronicles eight contestants in the 1999 Scripps National Spelling Bee. Nearly 19 months of shooting and 100 hours of video later, Csicsery had documented the demanding process that students and coaches go through to reach the pinnacle of high school mathematics competitions, the IMO.

Produced by the MAA, *Hard Problems* follows the 2006 U.S. team all the way from the earliest stages of testing and training to the final contest problems and prize ceremony at the IMO in Ljubljana, Slovenia. Along the way, Csicsery profiles each of the six members on the U.S. team, giving viewers a glimpse into their lives both inside and outside of mathematics, including their families.

Hard Problems opens before the U.S. team heads abroad, concentrating on the selection process and on the effort put in by both students and coaches to prepare for the intense two-day, six-problem competition. Once the team arrives in Slovenia and the IMO itself begins, Csicsery gives viewers a peek into the large, crowded, yet eerily silent gymnasiums in which the students take the exams, and the relationships that develop between students from different continents and different walks of life. The film also touches on some of the lesser-known details of the IMO, such as the complicated but fascinating process of judging and scoring the papers. It also highlights the prestige that comes along with earning a bronze, silver, or gold medal.

After the showing of *Hard Problems*, the crowd was delighted to take part in a question and answer session with Csicsery, AMC Director of Competitions Steve Dunbar, and three of the (then) high school students involved in the film. There were many questions, ranging from the difficulty of the problems to what the students are doing now and even whether or not they have girlfriends.

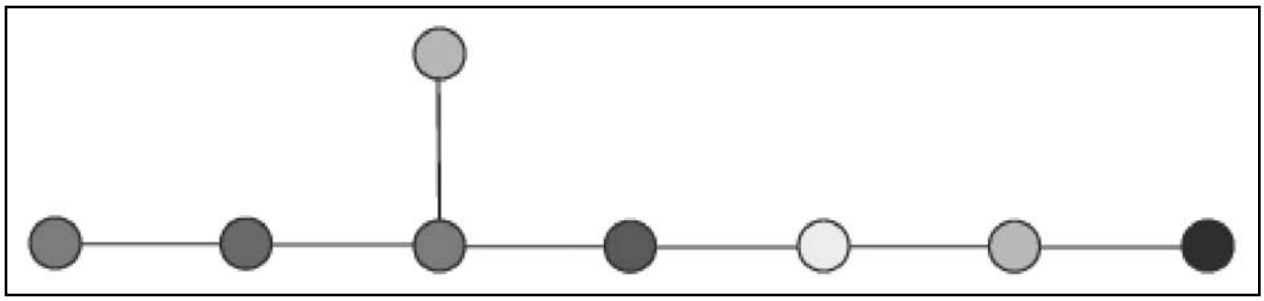
To help get a feeling for what the IMO participants go through, everyone who attended the January 8 premiere received a copy of the six problems the students faced in Slovenia. Also, the first 100 copies of the *Hard Problems* DVD came with a free CD containing solutions and commentary on the problems by Zuming Feng, coach of the U.S. team, plus all of the problems from the sequence of competitions leading up to the IMO.

Csicsery hopes that the film will attract audiences unfamiliar with the hard work that the young U.S. math prodigies put in and that it will "inspire others to see mathematics as those in the film already do — as the most challenging and the most rewarding of pursuits."

The E_8 News Story

By David W. Farmer and Sally Koutsoliotas

The American Institute of Mathematics (AIM) recently had the experience of promoting a math result in the media. We had hopes of reaching beyond the usual avenues that specifically cover math stories (such as MAA and AMS) to more mainstream science and technology media, such as *Science, American Scientist*, and the weekly *Science* supplement of the *New York Times*. We also wanted some local coverage: AIM is in the process of moving from Palo Alto to Morgan Hill, California, and we would like people in our local community to know about AIM and its activities in research mathematics.



The Dynkin diagram for E_8.

Our story on the representation theory of the exceptional Lie group E_8 grew far beyond our expectations. We were hoping for coverage in science and technology magazines, but in the final days a transition occurred and the story was picked up by the popular media. The E_8 story was covered in hundreds of newspapers, dozens of radio stations, and on local TV; it even made national news on NPR's *All Things Considered* and ABC's *Good Morning America*. Representative Jerry McNerney (D-Calif) delivered a statement to Congress about the E_8 result.

The E_8 story concerned part of a larger project called the "Atlas of Lie Groups and Representations." The project, led by Jeffrey Adams from the University of Maryland, has a goal of explicitly computing all the irreducible unitary representations of the real reductive Lie groups. Once computed, these data and some tools to make them more useful will be made available on the Internet. This will be valuable to researchers in several areas of mathematics and the sciences. The Atlas team has 18 members, a half-dozen of whom were directly involved with the E_8 calculation. Since E_8 is the largest of the exceptional Lie groups, handling it is one of the more difficult aspects of the project. The E_8 story concerned a big step in computing the irreducible unitary representations of E_8.

Exactly why the E_8 story made the news is still a bit of mystery. We don't have a magic recipe for turning a theorem into a news story. This article simply describes our experiences during the lead-up to the E_8 story and the few days when it was in the news.

The Decision to Promote the E_8 Story

On January 8, 2007, Brian Conrey, Director of AIM, received a long email from Jeffrey Adams. Most of the email was an account by David Vogan of MIT, a member of the Atlas team, about the final steps in calculating the Kazhdan-Lusztig-Vogan polynomials for the split real form of E_8. It was clear that they had made a major advance, and they were extremely excited about the result. Vogan's entertaining account described a long sequence of alternately fortunate and unfortunate events that led up to the final result. The people at AIM were immediately caught up in the excitement and decided that this was a story that deserved to be told.

AIM planned, at some time in the future, to promote mathematics news stories as part of its outreach efforts. We weren't really prepared for the E_8 result, but we couldn't resist the temptation to promote it because the E_8 story seemed to be a perfect fit. It had the necessary ingredient of being an important result in a difficult area of mathematics. More importantly, the initial phases of the work were sponsored by AIM, and then continued with support from AIM and the NSF. Finally, the result arose from a large collaboration, which fits perfectly with AIM's founding principle of supporting a collaborative approach to research mathematics.

The first step was persuading the Atlas team that turning E_8 into a news story was a possibility. Naturally, they were skeptical. Perhaps the biggest stumbling block was the apparent impossibility of making their mathematical results comprehensible to the public. The argument was: this is difficult to understand; why don't you wait for a story about the prime numbers or something else that you can explain to people? And how will you answer questions like "What is this good for?" Conrey brushed those concerns aside: "it will take some time, but with enough effort we will figure out how to convey a sense of the result and why it is interesting." He argued that mathematicians have to do a better job of promoting mathematics, and that we

owed it to mathematical community to seize this opportunity.

After some internal deliberations, Adams and the Atlas team were on board. The main people in charge of preparing the news release were Brian Conrey and David Farmer from AIM, and Jeffrey Adams and David Vogan from the Atlas team. Most universities have a public relations office with experience handling news releases, but AIM has a small staff and little knowledge in these matters. So we hired Shari Boxer Baker from JDS Group PR, a public relations firm, to assist in the preparations. Having put together a group of people, and still caught up in the excitement of the result, it was starting to dawn on us that there was a lot of work to do.

Preparations for the News Release

It was the middle of January and time to start work. When should we have in the news release? One idea was to get it out as soon as possible. But there were also arguments that the release should be associated with an "event." After some initial difficulties in writing a news release that anyone would want to read, we realized that getting the story out quickly was impossible. We set March 19 as our target date. The Atlas team would be meeting in Boston, and Vogan was scheduled to give a colloquium at MIT. This would be the "official announcement" of the E_8 result. That gave us about eight weeks to prepare.

Things got off to a rough start. We had no consensus on the strategy for releasing the story, and the mathematicians on the team had underestimated the effort needed to turn the new result into a story the general public would find interesting. Boxer Baker had experience with news releases, but she was not familiar with the culture of mathematics. While some of her ideas made sense to us, others seemed totally incompatible with the way mathematicians think.

One thing was clear: early in the process we needed to begin drumming up interest in the story. We contacted journalists and science writers whom we knew personally and told them of the interesting story about E_8 which would be coming out in a few weeks. Contacts included science writers who had previously written about AIM, people at MAA and AMS, and journalists at newspapers near AIM and MIT.

When we contacted those people, we had to tell them something about the story. In some cases (for those people we viewed as having a high level of interest in mathematics) we just forwarded Vogan's email with a short note at the top. Much to our surprise, Vogan's account, which we found exciting and fascinating, did not have the same effect on the people we hoped would write an article on E_8. The problem was that it is not immediately obvious how to make the story interesting to someone who isn't already familiar with Lie groups or the Atlas project.

The "Hooks." Things started to look up when we identified aspects of the

Show Me the Math!

The AIM website at http://www.aimath.org/E8 is the best place to learn more. While the front page, meant for the general public, is quite vague about the mathematics, there is a lot of information to be found by clicking on the various links. All we give here is a brief overview.

What is this E_8 thing anyway?

One of the most important ways to try to understand Lie groups is by studying their associated Lie algebras, which are essentially their tangent spaces at the identity. If we are after a classification, the natural thing is to try to find all the *simple* Lie algebras. To understand those, we look at their *root systems*, which have a fairly simple combinatorial description. The image that helped make the story visible is essentially a picture of the (eight-dimensional) root system for E_8.

The root systems are completely determined by their *Dynkin diagrams*, and it turns out we can find them all. The result is similar to what happens for finite simple groups. There are four infinite families of simple Lie algebras, known as A_n, B_n, C_n, and D_n, and then there are finitely many special cases: E_6, E_7, E_8, F_4, and G_2. Of these, E_8 is the largest, in the sense that it has the largest dimension. Using the correspondence between Lie groups and Lie algebras, we can talk about the (complex) Lie group E_8, a 248-dimensional complex manifold. The Atlas group was working with a *real form* of that group, that is, a 248-dimensional real Lie group which becomes isomorphic to E_8 when we complexify it.

What was computed?

For many purposes, the way to understand a group is to study its representations. In this case, the goal is to compute the unitary representations of E_8. In a theoretical sense, these are well understood. What the Atlas group wants, however, is an explicit list, and that requires turning a lot of very difficult and very abstract mathematics into something concrete enough to program. The computation that was completed in 2007 is only a step in the direction of that final goal: they found the Kazhdan-Lusztig-Vogan polynomials. These are a way to get a handle on the character table of E_8.

The size of Manhattan?

As the article notes, the description of the project as "a calculation the size of Manhattan" helped make the result understandable and appealing. That estimate was obtained as follows. The calculation produces a 453,060 x 453,060 matrix, each of whose entries is a polynomial in q with integer coefficients and degree up to 22. Assuming each polynomial requires a box one-inch square to be written, we get a matrix that is about 7 miles by 7 miles. That's actually *twice* the area of Manhattan… but the matrix is upper triangular.

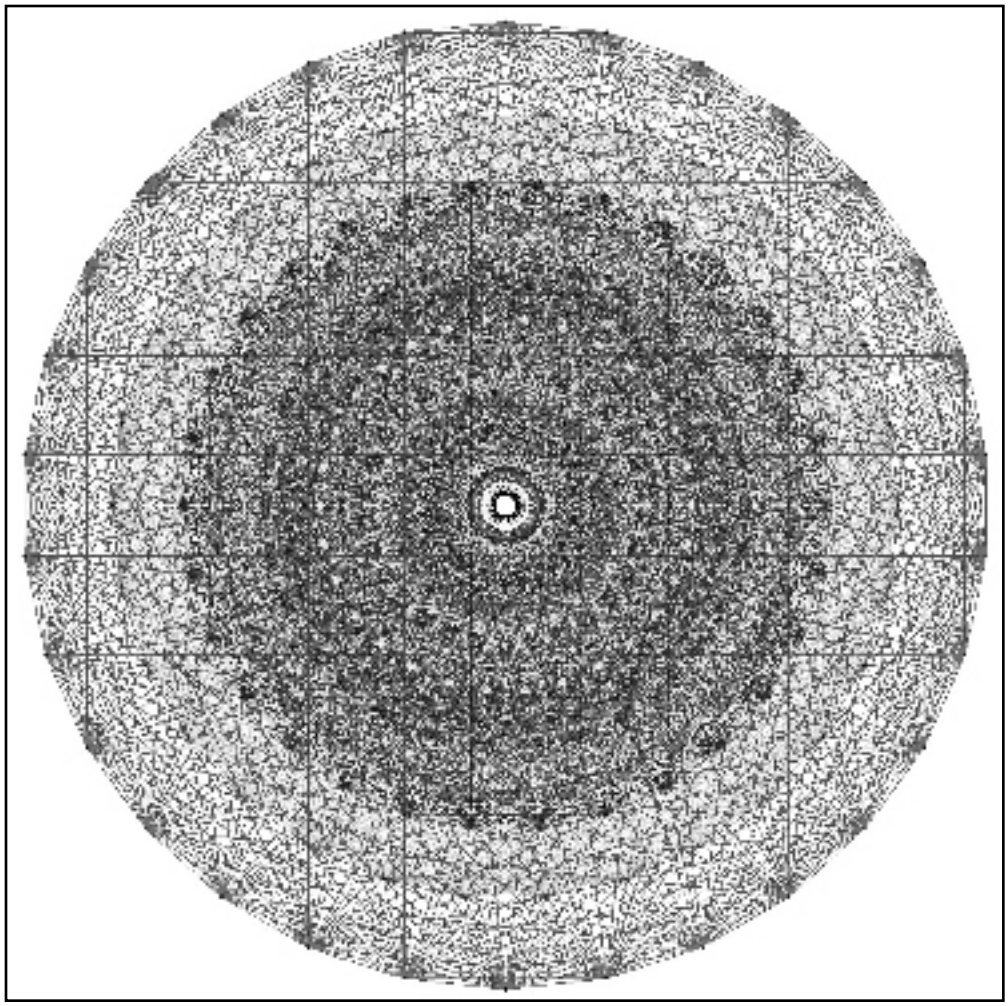
For the details, visit the E_8 website at http://www.aimath.org/E8.

E_8 result which could possibly serve as the focus of a story. Instead of looking for new ways to explain the mathematics, we started to focus on some of the less mathematical aspects that people might find interesting. These "hooks" would form the basis for our contacts with journalists, and additional information would be made available on a website we were developing. (Kat Snow, from KQED radio, explained the terminology of "hooks" to us.) We identified the following hooks:

1) E_8 is a beautiful symmetric object. Mathematics gives us a way to understand beauty that is beyond our direct perception.

2) The answer is enormous. If written out in small print, the answer would cover 50 square miles. Other scientific studies have analyzed large amounts of data, but this result is distinguished by the nature of the answer, and its enormous size.

3) It took a team effort to make this breakthrough. This large collaboration is in contrast to the typical approach in mathematics.



A two-dimensional picture of the eight-dimensional complex polytope 4_{21}, which is the convex hull of the root system for E_8. This "picture of E_8" appeared in many of the news reports on the calculation.

4) This result will have implications for future research. Lie groups and their representations are fundamental tools in several areas of mathematics and the other sciences. For instance, it is possible that the E_8 result could have implications for string theory.

It turned out that there was yet another hook we hadn't considered: E_8 was discovered 120 years ago, and now we are a lot closer to understanding it. Many reporters took this to mean (incorrectly) that the Atlas team had "solved a 120 year-old problem."

And there was one hook we decided not to use. Fokko du Cloux was the primary author of the computer code used for the E_8 calculation, but he died of ALS (Amyotrophic Lateral Sclerosis, also known as "Lou Gehrig's disease") shortly before the calculation was completed. This certainly had the potential to be a big "human interest" story. But we decided not to emphasize that aspect, out of concern that it would appear exploitive or would detract from the mathematics.

The E_8 website. The main source of information would be a press release and an accompanying website that Adams and Farmer were developing. The press release and the website would both start with the same four-sentence paragraph: one sentence for each of our hooks. We figured this would maximize the chance of people wanting to read further. The press release would be prepared last, condensed from material on the website. The opening paragraph was written at least ten times, by several people. The final version was a composite of the best sentences.

The plan for the website was a main page written at the level of a newspaper article, with links to more detailed information. Our first attempts were deemed incomprehensible by our test audience (Boxer Baker and our non-mathematical friends and relatives), so that text was moved to the supplementary pages.

We also needed some quotes for the story, both from outside experts and from the people involved in the project. Conrey contacted outside people to ask for quotes, and in some cases he condensed (with permission) a longer email into a more quotable blurb. The quote by Peter Sarnak, from Princeton, gave credible evidence that the result was important,

and set the E_8 result in the wider context of Lie groups and their representations. The quote by the physicist Hermann Nicolai, from the Max Planck Institute, gave evidence that the work was interesting to more than just mathematicians. Both of those quotes were important for gaining the attention of science writers.

A "picture" of E_8? Preparing all the material for the website and the press release took an enormous amount of effort, but we knew that it was just a matter of putting in enough time. More problematic was finding a "picture" to go with the story. Almost every newspaper and magazine article has a picture to go with it, so we needed a graphic for the E_8 story. Early versions of the web site had a picture of the E_8 Dynkin diagram and the crystal graph of the adjoint representation of the Lie algebra of E_8, as well as a photograph of (most of) the Atlas team. These were inadequate accompaniments for the news story because they wouldn't capture people's interest.

Conrey set himself the task of finding a good E_8 graphic. He began in February, but a few weeks of poking around amounted to nothing: nobody knew of anything related to E_8 and nobody had any new ideas. Conrey decided that John H. Conway, from Princeton, was his best hope. If he could get Conway working on the problem, then we would have our graphic. With less than a week to go before the press release, time was running out.

Bringing the pieces together. Six days before the release date we had a conference call with the press offices from Cornell, Maryland, Michigan, MIT, and Utah; each of those universities had a faculty member directly involved with the E_8 calculation. Since it would take a lot of time for a reporter to write a story on something this complicated, the press release would be sent out on Wednesday, March 14, embargoed until 11pm Sunday, March 18. This means that reporters have access to the news release and can begin background work, but agree not to publish anything until after the embargo date. This is common practice for science stories and this is how newspapers have stories on medical breakthroughs appearing on the same day the research article appears in a medical journal. The press release would go out on *Eurekalert*, a service for press releases in science and technology to which most science writers subscribe. Bulletins come out as a headline followed by one or two sentences, so it was important that the headline grab the writers' attention.

This left us with only two more days to work on the release. The people from the press offices were critical of some of our ideas. A key decision during that call was the headline for the press release: *A Calculation the Size of Manhattan*. This was suggested by Lee Siegel from Utah. The people with press experience also made clear the need for an interesting graphic.

We find a picture of E_8. In the late evening of Thursday, March 15, Conrey called Conway at home and offered him pretty much anything he wanted if he could come up with something by Sunday night. Conway said there was no way he could come up with something by Sunday, but that there might be a usable drawing by Peter McMullen in Coxeter's book *Regular Polytopes*. He told Conrey to call him the next day at the Common Room of the Princeton mathematics department (Conway's "office").

On Friday morning Conrey flipped through Coxeter's book and described the pictures to Conway. The book is about polytopes, not Lie groups, and he needed Conway to make the connection. None of the pictures were right. It turned out that it was the wrong book. So Conrey and AIM's librarian, Ellen Heffelfinger, went to the Stanford library and checked out Coxeter's *Complex Regular Polytopes*. This had a drawing by McMullen, but it wasn't quite the right one. It was missing 240 lines out of the approximately 10,000 lines in the correct drawing. They figured, however, that nobody would notice. Conrey had the picture scanned and sent around to the Atlas team. So now we had our graphic!

But then Heffelfinger found the correct picture in a paper by Coxeter. It is a drawing by McMullen of the *Gosset polytope* 4_{21}, which happens to be the convex hull of the root vectors of the Lie algebra E_8. This is a step or two removed from a picture of the split real form of the Lie group E_8, but we were out of time and it really was a beautiful picture. John Stembridge, a member of the Atlas team, quickly figured out the connection between 4_{21} and the E_8 root system and made a high-resolution color version of McMullen's diagram. Stembridge's colorful depiction of the E_8 root system became the icon associated with the story. We believed the picture was crucial to the story gaining the attention of the popular media.

The press release is out. The press release went out on *Eurekalert* very late on Wednesday. There had been earlier contact with reporters, primarily initiated by us. But the appearance of the embargoed release sparked new interest, and Adams and Conrey had more work to do corresponding with reporters. According to Adams, "On Thursday the 15th I did something I never thought I would do. I was on the phone with Brian, and my cell phone rang. I answered it and got back to Brian and said, 'Sorry, I have to go. *The New York Times* is on the other line'." Things were looking up: we were reaching the science and technology publications we had set as our target. We didn't know that the story was about to reach a wider audience.

Late Sunday night, 30 minutes after the embargo was lifted, *Google* found two web sites with the E_8 story: MIT (which was expected) and Iran TV. This was the first clue that something unusual was happening.

Days of News

Monday and Tuesday were about as close to a media frenzy as one could expect for a math story. The Monday activity was primarily centered at MIT, where the Atlas group was meeting. On Tuesday, the focus shifted to AIM where things were already busy because we were in the middle of the workshop on "Representations of surface groups." Those days were a blur and we can't vouch for the accuracy of the next two sections.

Monday. The Atlas group had planned one of their regular meetings for March

19–21 at MIT. Vogan's colloquium talk was deemed the "official announcement" of the E_8 result. Vogan made a poster, the talk was moved to a larger room, and MIT advertised it widely. Early that morning, Adams arrived at Logan airport (at 8:00 a.m.) and spent the cab ride to MIT talking to the *London Times*. The reporter was not their science reporter — they didn't want the story to be too technical. At the end of the call the *Times* person said, "I wish I understood this better, it sounds really neat." That was typical of what we heard from many reporters.

Adams gave his seminar talk, and then he and Vogan spent the hour-and-a-half before the colloquium answering email from reporters. At Vogan's talk there was standing room only in the 150-seat lecture hall. Peter Trapa, another member of the Atlas team, had a radio interview in Utah. A recording was emailed to the Atlas team. We began to realize that E_8 had become a big story.

Illustration by Brad Fitzpatrick

Adams was up until midnight talking to reporters and answering email. By then, the E_8 website had had 40,000 distinct visitors. We had no idea whether that was a large or small number for a news story. All this occurred in the midst of the Atlas group's workshop, which was productive despite all the distractions.

Tuesday. The day started with a live broadcast of Adams' interview on WBAI in New York City. Then Adams had a long telephone interview with *The Economist*. Conrey started the day with two radio interviews, one of which was for National Public Radio (NPR). NPR kept calling back to ask more questions, and they worked on the story until 30 minutes before it was broadcast on *All Things Considered*. That interview came out particularly well, giving a clear impression that something exciting and mathematical had occurred.

The New York Times arrived and we read the story in the Science section. Somehow we found time to look through the online versions of various newspapers. Farmer told Conrey, "Stop saying that 'E_8 is the Mount Everest of Lie groups.' It is misleading because Mount Everest is only a little bigger than the next highest mountain, and they didn't study E_8 just 'because it is there'." Twenty minutes later Conrey told us, "I just did another radio interview. They made me say the Mount Everest quote. Three times they quoted me as having said that before, so I had to give in and say it again."

Most of the day Channel 2 from San Francisco was at AIM. They interviewed Conrey, AIM Deputy Director Steve Krantz, and people from the current workshop. Oddly enough, the current workshop had some relation to representation theory, so the participants actually had something to say about E_8. In the background of many of the camera shots were whiteboards full of mathematics and groups of workshop participants talking math. Farmer was asked to write "something mathematical" on the board for the opening shot of the story. The quadratic formula and the Pythagorean theorem were deemed too complicated, so he decided to add fractions: 1/6 + 1/8. It took him three tries to get the right answer.

E_8 made it onto the blogosphere. John Baez and Peter Woit's websites have particularly high-level mathematical discussions, including some more details about the result. Other sites complained that the effort on E_8 should have been spent trying to cure cancer. During AIM's happy hour, Channels 7 and 11 from San Francisco showed up. It was quite a spectacle. The workshop participants were giving reports from the afternoon working groups while the camera crews were interviewing people and shooting "B-roll," which apparently refers to footage intended as the transition between the main parts of the story. The TV people don't seem to mind that the workshop was not about E_8.

The Channel 7 report appeared on the news on Tuesday night and again on Wednesday morning, while Channel 11 showed it on the Wednesday late news. Channel 2 did a live broadcast during the 5:30 news and the workshop participants erupted in laughter when their group reports were interrupted by bright lights and a loud voice saying, "This is Janine De la Vega reporting live from the American Institute of Mathematics." We assured the participants that we usually don't have these distractions during our workshops. Everyone wanted to know how we made E_8 into a news story. We answered, "It was a lot of work," but

the truth is that we don't know how this happened.

At 10:30 that night, Conrey was dozing in front of the TV when Boxer Baker called, "I set up an interview with CNN radio, but you have to talk to them right now." Conrey was too tired to make much sense and had to repeat things several times. Good thing it was a recorded interview.

Only 21,000 distinct visitors went to the E_8 web site on Tuesday.

Wednesday. The excitement continued, but there was less work. We made it to the front page of *Yahoo*, for about an hour. The *Google* ranking of our E_8 page was way up, and the E_8 entry on *Wikipedia* had been updated to reflect the new result. The main AIM page had a higher ranking, too. This was the first time we appeared on the first page when googling "AIM."

Our biggest surprise was a mention of E_8 on *Good Morning America*. No interviews, but they showed Stembridge's graphic. The weatherman poked fun at it later in the program. Then there was a message on Conrey's answering machine: "Hi, this is Jane Doe from the Associated Press. I'd like to talk to someone about the Lie group E_8." The AP story was picked up by hundreds of newspapers. That caused our web traffic to increase again.

Thursday and later. Things were still percolating. *Science* had an article by Dana Mackenzie. Adams was interviewed on camera by Al Arabiya, who planned a story dubbed into Arabic. A Canadian documentary team was going to talk to Vogan about possibly doing a story. Keith Devlin discussed E_8 during his "Math Guy" segment on NPR's *Weekend Edition*. The AIM staff and some workshop participants were interviewed for KQED's *The California Report*. We tried to talk about AIM, but they only wanted to hear about E_8.

One of the most pleasing and surprising outcomes of this saga was an address to the U.S. Congress by Representative Jerry McNerney. Representative McNerney described the E_8 result, commended the universities involved with the research, and explained that this work was made possible by congressional support of the National Science Foundation. He ended with the statement, "The participants are to be commended for their work that has expanded the limits of human knowledge and brings hitherto unknown beauty and power to grace our human condition."

Lessons Learned

It is impossible to draw any definitive lessons from this one experience, but we would like to share some of what we learned from the process.

Mistakes were made. If we had to do it again, we would do some things differently. In our efforts to drum up interest, we tried to promote the story before we had a good idea of what to tell people. Specifically, it was a mistake to contact journalists before we had a clear idea of the "hooks" for our story and before we had good supplementary information (the E_8 website) to show them.

We were lucky that we had a fairly long lead-time because we could get our act together and then contact them again, otherwise we would have spoiled an opportunity. This was a beginner's mistake. One good thing was that some reporters gave us useful suggestions on how to present the E_8 story in a way that people would find interesting. Once we started thinking in those terms, it didn't take too long to come up with a clear picture of the hooks for the E_8 story.

Another mistake was failing to make a clear distinction between journalists we would like to write a story, and editors who would be happy to commission us to write a story. Professional mathematics organizations may be interested in publishing a story, but in many cases you have to provide the text. We somewhat over-commited ourselves and then had to ask busy people to write yet another article.

This was a mistake only because of the unexpected popular attention the story received: if we had only reached the local press and the science and technology publications we were aiming for, then we probably would have been happy to do more work to publicize E_8.

Positive Lessons. There are also a few things we were pleased we did. One is that we stuck to a story that was mathematical and fairly abstract. The only mention of applications was to string theory, and that probably wasn't critical to the success of the story. Many people seemed to like the abstraction of it, the 248 dimensions, and the symmetry. This renewed our belief that pure mathematics can grab the public's attention.

Perseverance was crucial. Sometimes the E_8 web site seemed as if it would never be both comprehensive and comprehensible to its intended audience. Some of the articles, the one in *Science*, for example, arose in part because Adams, Conrey, and Vogan answered reporters' questions with many long emails describing various interesting aspects of E_8 from several different perspectives.

The key ingredients. In retrospect, we can see some key elements that were critical for helping the E_8 story to reach our intended audience. Surely those elements were also critical for helping the story to reach the popular media, but we do not claim to understand why that happened. These items were in no particular order.

A catchy title. People won't read past the headline if it doesn't capture their interest. This is certainly true for newspapers, but it is also true for a press release and on news services like *Eurekalert*. Finding our headline took a lot of effort.

The idea of measuring the size of the answer as an area occurred to us fairly early. The answer is a matrix of polynomials with 453,060 rows and columns. If each entry was a 1 inch square, the matrix would have an area slightly more than 50 square miles, so we put that in the text of the website.

Boxer Baker didn't like that description and she said we'd have to compare it to something people can picture, like Rhode Island. In the text of the website we wrote that the answer was "twice the size of Manhattan." Some of us had misgivings with the Manhattan comparison because the matrix is square and Manhattan is

not (mathematicians can be too pedantic at times!). Initially the headline was the uninspiring (and mathematically meaningless) "Mathematicians Map E_8." Finally, during the conference call with people from the press offices at Cornell, Maryland, Michigan, MIT, and Utah, the issue of a headline was raised. They strongly suggested "A calculation the size of Manhattan," and fortunately we agreed.

At least one good picture. Stories need pictures. It didn't make sense for us to use a picture of a person, because it was a group effort. So we needed a picture of the mathematics. It seemed like a hopeless task to find a picture of E_8, and we didn't hit upon a good graphic until the day before the official news release. How we found our graphic was described earlier.

It may be bothersome that the picture shows (a projection of) the E_8 root system, which can be thought of as the building blocks of the Lie algebra E_8. Admittedly, it is a few steps removed from the split real form of the Lie group E_8, so isn't that misleading? Trying to have complete mathematical accuracy, however, will just paralyze your efforts. The root system picture successfully conveys the concept of a "huge beautiful symmetric object."

A good example is the cover of the December 22, 2006, *Science* magazine illustrating Perelman's work on Ricci flow. The cover showed a "dumbbell" shape morphing into a sphere. The images convey some of the elements of the mathematics — it is about curvature, a change in curvature, and spheres. Unfortunately, the picture gets the mathematics wrong! If the dumbbell's surface moved in the direction of greatest curvature, it would "pinch off" in the middle, forming two spheres with cusps. This is actually a much better illustration of what Perelman did: he figured out how to handle the singularities that arise in the Ricci flow. But a picture of a dumbbell breaking into two teardrops which then morphed into spheres would (ironically) not have conveyed as accurate an impression to the average reader.

Resources with comprehensible background information. Since we didn't expect a newspaper to print our news release directly as a story, we needed to provide a source for more information. One possibility was an interview by a journalist, but we couldn't count on that and we couldn't handle more than a few of those calls anyway. A website was the easiest way to provide information on different levels. The main part of the website was at the level of a newspaper, with links to more detailed information.

On the E_8 website we made a deliberate effort to have the supplementary information link to another place on our own website because you tend to lose people once they follow an off-site link. This website was not publicly linked until the official release date, but the embargoed press release and personal emails to journalists mentioned the site.

Public relations experience. If we only expected the local papers to carry the story, then we would have handled everything ourselves. But we were hoping for a wider audience, so we needed help. AIM does not have a public relations department, so we hired professional help. The most obvious benefit was that we needed to come up with a plan. But a more important and more subtle issue is that we (and probably all mathematicians) didn't have a clear idea of how to discuss mathematics in a way that other people find interesting.

Half the effort of preparing for the news release was understanding how things should be done, and re-writing various parts of the story for the umpteenth time. If we had to do it again, it would be much faster. It also took some time for Boxer Baker, who had not worked with mathematicians before, to understand our constraints and how we do things. For example, we would claim to see a big distinction between pairs of phrases which, to her, said exactly the same thing. This made it a challenge to write something which everyone agreed was correct and comprehensible. But, had we been left on our own, it would merely have been correct.

We also made use of the public relations office at the National Science Foundation (NSF) and at the home universities of members of the Atlas team involved with the E_8 calculation: Cornell, Maryland, Michigan, MIT, and Utah. A conference call with all those people was critical to the final steps of our preparations. Also, each of those universities was able to make use of their local media contacts. This was particularly important in the Boston area because MIT was hosting the official event marking the announcement of the E_8 result.

Web presence. On the announcement day, AIM's website prominently showed the E_8 graphic and the beginning of the story. The NSF and the universities involved also put the story on their web sites. The MIT site received a lot of traffic and referred many of the early hits to the E_8 page. We developed a "Fact Sheet" listing some statistics and factoids about the result. This was easy to read and also gave people something to latch on to. In retrospect, this should have been linked directly from the main E_8 page.

Why do we care? Reporters want to know what the result is "good for." It would be nice if reporters and the general public understood the value and the potentially huge (but long-term) payoff of basic research. But most of them don't (yet), so you have to relate the result to something "practical." One of the great things about math is that everything is connected, and nearly every area of mathematics has been used for something useful. A good example is Sarnak's quote about the E_8 result: "Understanding and classifying the representations of Lie Groups has been critical to understanding phenomena in many different areas of mathematics and science including algebra, geometry, number theory, physics and chemistry."

Develop multiple "hooks." Why is the story interesting? At first, all our efforts went into finding ways to explain the mathematics. An important step was realizing that there are interesting things about the E_8 story that don't require an explanation of what the Atlas team actually did. Once we had a clear idea of

our hooks, it was easier to talk to people about the story.

Associate the news release with an event. David Vogan was scheduled to give a colloquium talk at MIT on Monday, March 19, so we chose that for our release date. Embargoing the news until the release date helped create a sense of anticipation and suggested the news was important.

Lots of quotes! A dry narrative becomes more interesting when a real person is talking, so we needed some quotes. People not associated with the project can say things that the people on the project cannot. Most mathematicians will not describe their own work as "exciting" or "important," so we had to find other people to say it. Also, nobody on the Atlas team wanted to speculate about applications of their work to physics, so we had to find a physicist to talk about that. The quotes from Sarnak and Nicolai were instrumental here.

One thing we were told (and still find hard to believe), is that in the press release the quotes from the researchers should come up early, with supporting quotes from outside experts to appear later. Apparently mathematicians think the outside quotes are important for establishing that the result is worthwhile, but reporters just want to get the story as fast as possible.

Availability of key personnel. Adams, Conrey, and Vogan were quick to reply to questions from reporters and requests for interviews. There wouldn't have been any articles if they didn't go to the effort to give fast and thorough answers to email questions and to promptly return telephone calls.

David Farmer is Director of Programming at the American Institute of Mathematics. Sally Koutsoliotas is Associate Professor of Physics at Bucknell University. The press release and links to the various stories referred to in this article are available on the E_8 website at http://aimath.org/E8/.

Call for Suggestions for Gung and Hu Award

The Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics is the most prestigious award for service offered by the MAA. This service may have been in mathematics or in mathematical education. It may comprise one or more activities. The period of service may have been short or long.

The Selection Committee maintains a list of individuals worthy of consideration for the award, and annually solicits suggestions for additions to this list. Suggestions should be sent to the Association at the address below to be forwarded to the selection committee. Names suggested by March 1 will receive current consideration; others will be considered in future cycles.

Individuals suggested for consideration should be widely known and respected throughout the MAA and the mathematical profession for the national scope and beneficial impact of their professional work and service. For this reason, suggestions should be short (at most two double spaced pages, in 12 point font) highlighting the most important aspects of the person's career and impact. It is helpful to include one or two URLs for relevant websites; it is not helpful to include multiple letters of recommendation.

Gung and Hu Awards Committee
Mathematical Association of America
1529 Eighteenth Street NW
Washington, DC 20036

HOM SIGMAA Student Paper Contest in the History of Mathematics

The History of Mathematics SIGMAA is pleased to announce its 5th annual writing contest for undergraduates. The contest encourages undergraduates to conduct research into the history of mathematics and write expository articles.

Winning papers are posted on the HOM SIGMAA website and on Convergence! Winners also receive a MAA student membership and a (moderate) shopping spree in the MAA bookstore.

Any undergraduate is welcome to submit a paper, on any topic in the history of mathematics. Judging is done by a panel of HOM members.

For more information on the contest or the HOM SIGMAA, Please contact Amy Shell-Gellasch at shellgae@plu.edu Or visit http://www.maa.org/sigmaa/hom. The deadline for submissions is March 31, 2008.

Errata for the Report on Donations 2006/07

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FOCUS on Students: Why Join?

By Robert W. Vallin

Why join? That's a natural question to ask. In college one can join a fraternity/sorority, or attend the meetings of a Student MAA Chapter, or play intramural sports. In all these cases, "Why Join?" has the same answer: socialization. People desire to find like-minded persons to be with. To find them, people look to the professional organization.

Math students can become members of the MAA, the AMS (American Mathematical Society), SIAM (Society for Industrial and Applied Mathematics), AWM (Association for Women in Mathematics), NCTM (National Council of Teachers of Mathematics), and several others. The obvious reason for a student to join is the Professional Activities line of the resume. Showing that you belong to professional groups indicates a commitment to your vocation that employers like to see.

There is more, though. Joining can provide you with many benefits, some more obvious than others, that will be helpful to you as a professional and as a person. Associations provide professional development, networking opportunities, and venues for publication. They also offer many opportunities for members to make their own contributions to their profession. Getting the most out of membership is about finding out what the group can do for you and taking advantage of it.

Once, at a meeting, I heard someone remark, "Students should become members of the MAA because they should be good mathematical citizens." However nice a thought that is, the days of joining because it's the "correct" thing to do are long gone. People want to know what it is they are getting for their money. Yes, it may cost you to join, but it is worth it? To quote Mary Ellen Slater, writer for the Jobs section of the *Washington Post*, "Student and junior memberships are often available at deep discounts, so don't let cost be an obstacle. The contacts that such a group can provide are invaluable." From the MAA, you get a lot for the cost, no matter where your interests lie.

When you join the MAA, you help to support the largest professional organization devoted to undergraduate mathematics. The Association publishes three journals (*The American Mathematical Monthly*, *The College Mathematics Journal*, and *Mathematics Magazine*), *Math Horizons* magazine, which introduces undergraduates and math enthusiasts to topics not seen inside the classroom, and the news magazine MAA FOCUS. Online there is MathDL and the *Journal of Online Mathematics*. Both *MAA Reviews*, which is a huge database of mathematics books and reviews, and the *Classroom Capsules and Notes* website, which makes available electronically years of accumulated wisdom and experience about teaching, are accessible only to members of MAA.

The MAA has 29 regional sections which hold meetings at least once a year with both student and faculty talks. Any student who gives a talk at a Sectional Meeting receives a free one-year membership in the MAA. Twice a year there are large, national meetings: MathFest in August and the Joint Mathematics Meetings in January.

Meetings are a chance for you to interact with people who have similar interests and find out the latest news and results in mathematics. MathFest has a graduate student poster session and multiple sessions in which undergraduates can give talks. At the Joint Meetings there is a huge poster session where undergraduate students speak on their work and a plethora of sessions on research and teaching topics. Students who speak at MathFest are eligible for financial support for their travel expenses.

Additional items that your MAA membership helps support the MAA include producing the brochure *We Do Math! Careers in the Mathematical Sciences*, which contains profiles of mathematics majors who went on to successful careers in various fields. The MAA supports workshops and programs to help faculty in their professional growth. For undergraduate students there are Research Experiences for Undergraduates (REU) programs and National Research for Undergraduates Programs (NREUP), which specialize in research experiences for minorities. The latter is supported by a National Science Foundation grant administered by the MAA. The MAA and the Tensor Foundation also supply grants for Women and Mathematics Projects. Regional Undergraduate Math Conferences (RUMC) are partly funded by the MAA; these are conferences for undergraduates, with talks aimed at them and with many opportunities for them to speak on their own research.

The MAA has a lot to offer graduate students. MAA journals have many articles devoted to teaching which can help you. You may find the perfect way to present related rates or, maybe more importantly, an outlet for you to sneak Lebesgue integration into Calc I. There are journals for you to publish teaching articles, recreational math, expository works, and a new view on an undergraduate topic. Regular features such as "Proofs without Words," and the "Classroom Capsules" can be fun and important resources for you. The MAA also maintains web pages on employment opportunities for mathematicians at all levels, not just PhD mathematicians.

As many of you will discover when you get your first academic job, there is more to being faculty than teaching and research. The MAA is also the place for your continued scholarly growth. You can participate in workshops (e.g. PMET — Preparing Mathematicians to Educate Teachers, and PREP — Professional Enhancement Program) whose recent topics include *The Genius of Euler*, and *Revi-*

talizing College Algebra. Additionally, there are minicourses and short courses found at MAA meetings and elsewhere. At the Joint Meetings in San Diego , for example, these included an MAA Short Course on *Combinatorics: Past, Present, and Future*.

In addition, there are now eleven SIGMAAs (Special Interest Groups within the MAA), available for you to join, running the gamut from Quantitative Literacy to Math and the Arts. And, of course, after you obtain your first academic job, there's Project NExT (New Experiences for Teachers) and Section NExT. All said, membership in the MAA helps you create and maintain connections with people who share your interests and enthusiasms. If you are in your first year after obtaining your PhD, the MAA will give you a free one-year membership. There's no reason not to take advantage of this deal.

So regardless of how far along you are on your mathematical pathway, there is something a professional organization can offer you. Being a member is more than just a line for your resume. Belonging is not an expense, but an investment. It is an important part of starting and maintaining your professional career. Whether you are an undergraduate or graduate student, a junior faculty member or more seasoned professor, joining the MAA has its benefits for you.

Why Did *You* Join?

If you are reading this, you are probably a member of MAA. Why did you join? Why have you renewed your membership over the years? We will publish the best "Why I joined" and "Why I am still a member" articles in future issues of MAA FOCUS. Send them to the editor at fqgouvea@colby.edu.

Professional Associations in Mathematics

There are many professional associations for mathematicians in the United States, ranging from very broad (MAA, AMS, NCTM) to very specialized (for example, the Association of Christians in the Mathematical Sciences, Psychology of Mathematics Education, or the Society for Chaos Theory in Psychology and the Life Sciences). And, of course, there are many international associations as well.

The following is only a partial list. It includes all of the associations that are members of CBMS, the Conference Board of the Mathematical Sciences, an umbrella organization whose purpose is "to promote understanding and cooperation among these national organizations so that they work together and support each other in their efforts to promote research, improve education, and expand the uses of mathematics."

AMATYC	**American Mathematical Association of Two-Year Colleges**
AMS	**American Mathematical Society**
AMTE	**Association of Mathematics Teachers Educators**
ASA	**American Statistical Association**
ASL	**Association for Symbolic Logic**
AWM	**Association for Women in Mathematics**
ASSM	**Association of State Supervisors of Mathematics**
BBA	**Benjamin Banneker Association**
INFORMS	**Institute for Operations Research and the Management Sciences**
IMS	**Institute of Mathematical Statistics**
MAA	**Mathematical Association of America**
NAM	**National Association of Mathematicians**
NCSM	**National Council of Supervisors of Mathematics**
NCTM	**National Council of Teachers of Mathematics**
SIAM	**Society for Industrial and Applied Mathematics**
SOA	**Society of Actuaries**

Descriptions of each of these associations can be found at the CBMS website at http://www.cbmsweb.org/Members/member_societies.htm.

For a much larger list of professional associations for mathematicians, visit http://archives.math.utk.edu/societies.html.

Correction

There was an unfortunate misprint in Wendy A. Weber's article "Asking Questions," in the December issue. The second of the sample questions starts "In response to your question of how to define yk…" The "yk" should, of course, be "y^k". We apologize for the error.

Carleton College Summer Mathematics Program for Women

By Stephen Kennedy

The mathematics department of Carleton College will again offer a month-long summer mathematics program to 18 mathematically-talented first- and second-year undergraduate women in 2008. By introducing these students to new and exciting areas of mathematics that they would not see in a standard undergraduate curriculum, and by honing their skills in writing and speaking mathematics, the program leaders encourage young women on to advanced degrees in the mathematical sciences. More importantly, we work to increase each woman's confidence in her own abilities and to connect them all into a supportive network that can carry them through the remainder of their undergraduate and graduate education.

At the heart of the program are two demanding, intense courses under the supervision of female faculty who are accomplished researchers and extraordinary teachers. In summer 2008 those teachers (and courses) will be Professor Erica Flapan of Pomona College (Topology and Chemistry) and Professor Karen Brucks of The University of Wisconsin Milwaukee (Low-Dimensional Dynamical Systems). Besides the coursework, participants take part in a variety of mathematical events: panel discussions on graduate schools and careers, colloquia on a variety of topics, recreational problem-solving, and visits from at least one REU organizer and the organizer of the Budapest Semester. The mathematical part of the program is balanced with optional weekend events including canoeing, hiking, picnics, and tubing.

Past participants (through program evaluations and the list server set up for their correspondence) report increased facility with mathematics, bolstered self-confidence, and new or renewed excitement toward mathematics.

If you have first- or second-year women students whom you think would benefit from a demanding, invigorating month-long exposure to mathematics next summer (June 22-July 20), please refer them to our web page at http://www.mathcs.carleton.edu/smp or have them contact Deanna Haunsperger at Dept. of Math, Carleton College, Northfield, MN 55057 (dhaunspe@carleton.edu). The deadline for applications is February 22, 2008.

Steve Kennedy is Professor of Mathematics and Chair of the Department of Mathematics at Carleton College.

A fun math Mad Lib™ brought to you by…

Pacific Coast Undergraduate Math Conference

Dear (favorite mathematician),

The third annual PCUMC was totally (adjective)!! (large number) students came to the (adjective) campus of Loyola Marymount University on April 5, 2008. The best part was the keynote address given by Joe Gallian, the President of the MAA! You know him—he's the one who wrote that awesome algebra textbook featuring all the quotes from the (musical group a.k.a. the Fab Four).

I would have forgotten the registration deadline except that it was on Pi Day, March 14, 2008. It was so convenient to use my (type of technology) to register for the conference online! All I had to do was enter www.pcumc-math.org into (favorite browser) and the rest was obvious. The registration fee and lunch cost me $ (number < zero)! I even got funding to help pay for my flight from (location). Since I presented my work on (favorite math topic), I was able to receive $250 and my friends who were too (adjective) to give a talk received $150.

The day featured (number) talks by undergraduates about their research projects, senior theses, really cool problems from class, and historical information about mathematicians! We learned about career options at the NSA, Raytheon, and the Aerospace Corporation, and got to talk to graduate students from local schools. There was even a session about undergraduate research opportunities and math club activities.

I learned a lot and am (adjective) that I went. Thanks for encouraging me to attend!

Sincerely,
(person's name)

PCUMC is sponsored by Loyola Marymount University, Lewis and Clark College, and Pepperdine University and receives major funding from the NSA, NSF Grant DMS-0241090 through the MAA RUMC program, and the Raytheon Company.

Teaching Time Savers: A Duo of Homework Helpers

By Judith Harper Morrel

"The only way to learn mathematics is to do mathematics," wrote Paul Halmos in *A Hilbert Space Problem Book*. While this adage surely applies to mastering graduate-level work, it may apply even more strongly to undergraduates learning mathematics. The regular assigning of homework is a staple of all undergraduate mathematics classes, and with it, comes the burden of grading such homework. Students are much more likely to attempt their homework if there is some sort of tangible reward for doing so — some sort of grade. I, too, was a student once and I remember that assignments which were to be graded migrated to the front of the "to-do" list and those which were not to be assessed fell to the bottom.

I believe it is vitally important to assign and assess homework on a daily or almost daily basis. The grading of this much homework can be burdensome. You may be fortunate enough to have student graders at your institution. Some of us, even though we have 30+ students in each of 3 or more classes, may not have this luxury.

I have observed that some faculty members in this situation have abandoned the regular collection of homework, a practice that seems to me to have negative consequences for many students. So the challenge is to find a way to relieve the burden of homework grading yet still provide motivation for the students to do their homework. One solution, of course, is to collect homework and only grade selected problems. That can lead to student complaints: "You never grade the ones I did, only the ones I didn't do!" Over the years, I have tried a couple of remedies which seem to alleviate the situation.

One way to reduce the amount of homework grading by half is to flip a fair coin at the beginning of class each day. If the coin turns up "heads," homework is collected; if it turns up "tails," it is not. With this scheme, (most) students feel obligated to attempt every problem on each homework assignment, because there is always a fair chance that it will be collected. I sometimes modify this technique; for example, if I know that the homework assignment is particularly hard and many students are likely to have had trouble with it, I might conveniently "forget" to bring a coin. I have used a two-tailed coin on occasion, but the students respond very positively if I "forget" to bring one. This technique obviously reduces the amount of grading by about half, even though the distribution may not be as uniform as you would like!

(On a side note, if the course happens to include some probability, this technique can help illustrate the idea of how a binomial distribution behaves with a small number of trials.)

Another technique that I have used is to collect all homework, but grade it with a quick and easy scheme. There are four grades available, ✓+, ✓, **X**, and **0**. A grade of ✓+ means a very good job on the assignment — almost all of the problems are completed correctly and all were attempted with real effort. A score of ✓ means "satisfactory;" i.e., almost all of the problems were attempted and most of those attempts are correct. If a student earns an **X**, this is unsatisfactory — either most of the problems were omitted or most were wrong. Obviously, a **0** means nothing was turned in. With only a bit of practice (especially if the assignment includes problems you have assigned many times before, as in a calculus class), this assessment technique goes quite quickly. At the end of the semester, I assign numeric grades as follows: ✓+ = 90%, ✓ = 80%, **X** = 60%, and **0** = 0%. Each student then has a homework average which factors into his or her final grade, according to the scheme announced on the syllabus.

When time is really at a premium, I combine the two schema above: flipping to collect approximately half of the assigned homework and grading what is collected quickly and efficiently with the ✓system.

Time spent: 10 seconds flipping the coin at the start of class for the first technique; no additional time for the second.

Time saved: About 50% of homework grading time for the first technique; about 60% less time spent on each homework assignment for the second technique

Judi Morrel teaches at Butler University and is the Associate Dean of the College of Liberal Arts and Sciences.

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

Found Math

"I could never imagine that a tiger could so effortlessly leap from the ground on to an adult elephant's head, which is at least 12 feet (nearly 4 kilometers) above the ground," Vivek Menon, executive director of Wildlife Trust of India, said of the 2004 attack.

— *National Geographic News* (online), January 10, 2008

Prizes and Awards at the 2008 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 8, 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. An article on the undergraduates who won research prizes is planned for our March issue. For details about the prizes, including the official citations, brief biographies of the prize winners, visit http://www.maa.org/news/011408jmmprizes.html; for more on MAA awards, visit the awards page at http://www.maa.org/awards/.

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 David P. Robbins prize, offered this year for the first time, honors "the author or authors of a paper reporting on novel research in algebra, combinatorics, or discrete mathematics." It will be awarded every three years. 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

James Morrow
University of Washington

Annalisa Crannell
Franklin and Marshall College

Kenneth J. Gross
University of Vermont

Chauvenet Prize

"It is easy to determine whether a given integer is prime," *Bulletin of the American Mathematical Society* 42, 2005, pp. 3-38.

Andrew Granville

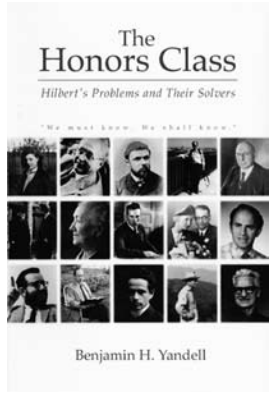
Beckenbach Book Prize

Euler: The Master of Us All
Mathematical Association of America
1999

William Dunham

Euler Book Prize

The Honors Class. Hilbert's Problems and Their Solvers, A K Peters, 2002.



Benjamin H. Yandell

Certificates of Meritorious Service

Illinois Section

Herbert Kasube

Kentucky Section

Donald E. Bennett

Missouri Section

Victor Gummersheimer

North California, Nevada and Hawaii Section

Leonard Klosinski

Seaway Section

H. Joseph Straight

Wisconsin Section

Andrew Matchett

Yueh-Gin Ging and Dr. Charles Y. Hu Distinguished Service to Mathematics

Lida K. Barrett

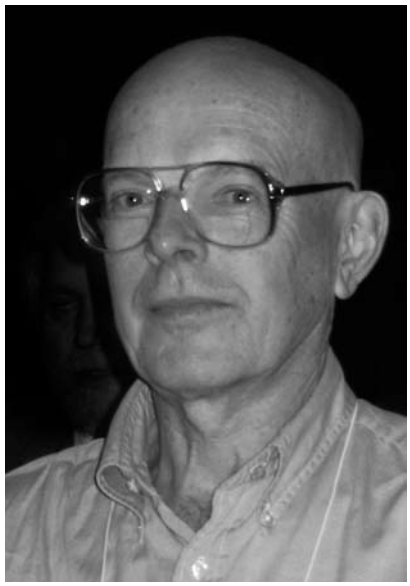
JPBM Communications Award

The Joint Policy Board for Mathematics, which represents AMS, ASA, MAA, and SIAM, give this award to writers "who, on a sustained basis, bring mathematical ideas and information to the nonmathematical public."

Carl Bialik

David P. Robbins Prize

"The on-line encyclopedia of integer sequences," *Notices of the American Mathematical Society*, Vol. 50, 2003, pp. 912-915.



Neil J. A. Sloane

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

This prize is jointly awarded by AMS, MAA, and SIAM.

Nathan Kaplan

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." This year, two young women won the Schafer Prize.

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

Galyna Dobrovolska

Alison Miller

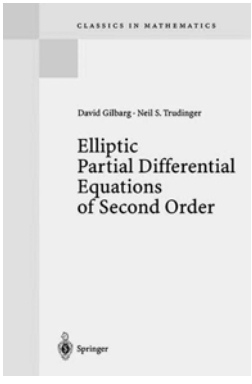
Louise Hay Award for Contributions to Mathematics Education

Harriet Pollatsek

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 Leonard Eisenbud Prize for Mathematics and Physics for a work or works that bring mathematics and physics closer together, the Bôcher Memorial Prize for a notable paper published in analysis in the last six years, the Award for Distinguished Public Service, awarded every two years to a research mathematician who has made a distinguished contribution to the profession, the Frank Nelson Cole Prize in Number Theory, and the Joseph L. Doob Prize for a recent, outstanding research book.

Leroy P. Steele Prize for Mathematical Exposition



Neil Trudinger
Elliptic Partial Differential Equations of Second Order

Leroy P. Steele Prize for Lifetime Achievement

George Lusztig

Leroy P. Steele Prize for Seminal Contribution to Research

Endre Szemerédi

Levi L. Conant Prize

J. Brian Conrey
"The Riemann Hypothesis"
Notices of the AMS, 2003.

Bôcher Prize

Alberto Bressan

Carlos Kenig

The third Bôcher Prize went ot Charles Fefferman, who was unable to attend.

Frank Nelson Cole Prize in Number Theory

Manjul Bhargava

Leonard Eisenbud Prize for Mathematics and Physics

Hirosi Ooguri

Cumrum Vafa

Hirosi Ooguri, Andrew Strominger, and Cumrum Vafa
"Black Hole Attractors and the Topological String"
Physical Review D, 2004.
Strominger was unable to attend.

Joseph L. Doob Prize

Heights in Diophantine Geometry
by Enrico Bombieri and Walter Gubler.
Gubler was unable to attend.

Enrico Bombieri

AMS Award for Distinguished Public Service

Herbert Clemens
University of Utah
Clemens was unable to attend.

(Speaking in favor of) Redundancy, Inefficiency, Extravagance, and Waste

A Haimo Award Talk

By Annalisa Crannell

The title for this talk is taken from a phrase that appears in an excellent-but-obscure essay written in 1980 by Kenneth Boulding (former president of both the American Economic Association and the American Association for the Advancement of Science). The essay is entitled "Graduate Education as Ritual and Substance," and it can be found in the book *The Philosophy and Future of Graduate Education*, edited by William Frankena (University of Michigan Press, 1980). I love this paper, but I have to warn you that there are many ways in which this is a peculiar talk for me to give.

Take the first two words: redundancy and inefficiency. I'm a person who carries this planner with me everywhere. If I need a new part for one of my home appliances, I've got the model and serial numbers listed here. I keep all my meetings and to-do lists in here. All of them. No post-it notes. I don't even hold formal office hours; instead I train my students to sign up for appointments by writing their names in this book.

I can describe the philosophies and practices of the major time management/organization gurus of our time (Stephen Covey, Hyrum Smith, Julie Morgenstern, David Allen), and—as my husband will tell you — at the slightest provocation, I will hold forth on the strengths and weaknesses of each of their approaches. People have used a lot of adjectives to describe me, but I'm guessing that no one has ever said "inefficient."

What about extravagance and waste? One of my friends, at a party at my house, once explained to everyone else there that whenever they were around me and described buying anything, they should add the phrase, "for which I paid too much." She herself had just told me that that she'd paid $2.50 for a child's rain coat (for which, she added as she looked my way, she paid too much). I told her that in fact, I could imagine circumstances under which someone might actually want to pay that much for a kid's raincoat, although I myself seldom pay more than $1.00 (and usually half of that or less) for my own children's clothing. Or for mine, for that matter. I think I paid 50 cents for this dress. (You didn't really need to know that).

I do my own plumbing repairs; I cut my family's hair; I've been known to repair umbrellas with used chopsticks… so even in a profession as famously frugal as math, I'm a bit of a tightwad. So I seem like an unlikely person to speak in favor of extravagance and waste…

But I will anyway, although I'll take a circuitous route.

I'd like to use this time to reflect on what we do and who we are. We often confuse these two things; people ask, "So, what do you do?" and we answer, "I am…" "I am a taxi driver, an accountant, a teacher, a doctor." My husband earns his money by writing and doing public relations, but at heart he is a bicyclist, a joke teller, and an acolyte of C.S. Lewis.

Mathematicians are fortunate because these two things — what we do, and who we are — very often closely coincide. We do mathematics; we are mathematicians. Mathematicians will say things like, "we get paid to do what we love." Some even go so far as to say we'd do this even if we didn't get paid for it. You laugh, but if you come to meetings like this, you'll see this sentiment borne out by the number of retirees who are present. Retirees from business don't go to trade shows; they go to the golf course. But "retirees" from math do go to seminars and conferences. Looking at these colleagues of mine tells me awfully good things about the way I've chosen to spend my life.

So that's a fifth thing that you should know about me: the first four are that I'm not redundant, inefficient, extravagant, or wasteful (at least in the usual sense), and the fifth is that I am, gosh darn it, a mathematician.

Now let's turn to teaching.

When we try to convince others that they ought to *verb* math (where for "verb" you could substitute "learn," "appreciate," "use," "fund," "love," among others), we do so along two standard lines of argument. Here they are, in their full Aristotelian glory:

Math is beautiful.
Math is useful.

There you have it, form and function, some details omitted. This pair always reminds me of a poem by Joanne Growney:

Each one I meet I ask, "do you
find mathematics beautiful
or useful? All answer, "Useful.
I use math every day." My eyes
reveal that I want proof, and each
goes on to tell that she subtracts
to keep her checkbook, and
sometimes multiplies to find
the size of carpet for the dining room.

If I, instead, would say, "Do you
find beauty or utility
in poetry?" would each person say,
"It's useful. I use if every day."
For proof would she go on to tell
that rhymes help her remember
the number of days each month—
like "Thirty hath September" —
and spellings of words with "i" and "e."

Someday utilitarians
will join with me to see
beauty in mathematics —
and in poetry.

"Mathematics and Poetry are Beautiful." (In her book *Intersections*, published by Kadet Press in 1993.)

We tell our students that their lives will be richer if they major in mathematics — even if they just take a few more courses in math. We tell them that calculus is a subject that changed the way we look at the world, so that they can't fully understand modern discourse if they don't understand calculus. We tell them that they are at college to become well-rounded, so they should add math to their mix of courses. We tell them that, you never know, later on in life, when you might actually want to use this stuff.

So here's where my talk departs from the usual. Because we could take out the word "math," replace it with just about any other academic subject, and it would still be true.

Archeology is beautiful.
Archeology is useful.

Organic Chemistry is a subject that changed the way we look at the world, and we can't fully understand modern discourse if we don't understand it. You never know, later on in life, when you might actually want to speak another language. Our lives will be richer if we study even a little philosophy.

By saying this, I don't mean to denigrate mathematics in the slightest. (I see Joe Gallian getting ready to jump up and take away my award!). I do believe that mathematics is fundamental and eternal in a way that no other discipline is. I agree with Galileo, who wrote that mathematics is the alphabet with which God has written the universe.

But I think we do a real disservice to our students (and to ourselves, but I'll get back to that later) if our last serious intellectual encounter with anything outside of mathematics happened during our senior year of college. Paradoxically, if our own intellectual lives are "all math, all the time," we face a lot of challenges when we try to woo others into our discipline.

One of these challenges is that that we'll be seen as "out of it" — that we love math (they think) because that's the only thing we're good at. Our assurances that mathematics is beautiful and useful are merely self-serving ignorance, sort of like parents trying to advise teenagers on which clothes to buy. What do we know?

Another is that we'll be seen as hypocritical — after all, we tell our students that we are training them to become life-long learners. What must they think of our urging them to take math courses not required for their major or intended career if we ourselves long ago stopped learning anything outside of our own major, our own career?

A third, and I think most important, challenge is that we lose out on the chance to engage our brightest students in an academic territory where they are comfortable, to have a substantive conversation about Shakespearian tragedies (or whatever it is that turns them on) before we try to drag them into our lair. My pastor often reminds us, "people don't care what you believe unless first they believe that you care." My freshmen don't care what I believe about mathematics unless they believe that I care about them. Learning more about what our students are learning about gives us the chance to show that we care and understand. And then we can snag them and get them into math.

These are some reasons why I think our own academic breadth is important for our students. But what about for us?

So, a mathematician, an astronomer, a philosopher, and an anthropologist walked into a sushi bar. This sounds like the beginning of a joke, but in fact it's actually something that happened to me. When I first got to F&M, the nearest sushi place was one-and-a-half hours away in Philadelphia. Four of us young (and very hip, or so we thought) professors decided one Friday to road trip out there together. We had a long time to chat in the car. Because of something that had come up at a recent faculty meeting, I asked everyone, "If you had to miss a class to go to a meeting, how long would it take you to explain to someone else in your department how to take over?" I know for me, for calculus, the answer would be "less than 5 minutes":

We're doing section 3.7, graphical interpretations of the derivative. Draw a few graphs with secant lines and let delta-x go to 0. Have them do a couple of examples from the end of the section.

Done.

The astronomer said that he'd have to have the physicists take over; they're less familiar with his materials so it would probably take 15 minutes. But the philosopher and the anthropologist both balked at the question. You couldn't get someone in to cover your class — you'd just have to cancel it. The anthropologist studied Bali, and that's how she structured her Intro class, and no one else in the department knew that area. The philosopher finally conceded that if she were doing a week-long, completely self-contained unit on, say, Plato, and if the other instructor would do that whole week, well then maybe that would work. Maybe. But one class, no.

From this I learned that introductory classes in some other fields are as specialized as research is in ours. In fact, later on, the anthropologist and philosopher got to express amazement that although the mathematicians in our department are nearly interchangeable at the undergraduate level, even we don't understand one another when we talk about our research. They were even more amazed (and I must admit, jealous) when they found that at our conferences, other mathematicians come up after the talks to offer encouragement and helpful advice, rather than to challenge the speaker's thesis. Students think of math as competitive and the humanities as cooperative, but at our conferences, you'd see that the reverse is true.

That night was one I've remembered and treasured for a dozen years now.

I've had the opportunity to join a multidisciplinary book group on evolutionary biology. Every year, we pick a new book to read together and discuss over lunch on Fridays. Historians, geologists, French professors, and even biologists weigh in

on the evolutionary origins of altruism, on how geography influences human societies, and on sexual selection (did human beings evolve our intelligence because deep thinkers are more attractive to our potential mates? The deep thinkers at our table would like to think so.)

One year, after I got tired of sitting in the waiting area every week while my daughter took her dance lessons, I hired one of my friends who teaches dance to come over to our home once a week and give us "family dance lessons." We cleared out space in the garage and everyone from my two-year-old son and my three daughters to me and my husband — plus, quite often our neighbors — learned the swing and the samba. It was fantastic. You should try it.

Each one of these experiences — the sushi bar, the evolution lunch, the family dance classes — has been an intellectual and personal joy. Like traveling in a different land with a different culture, spending time with my colleagues from other disciplines opens my eyes to their world, and to my own as well. My experiences have changed the way I teach and the way I talk to my students. And by changing what I do, these experiences also change who I am.

Okay, here I am talking to people who are teaching and grading and serving on committees and trying to keep their research going and perhaps even having personal lives and trying to exercise and doing all those other things we think are important, and I'm adding yet another task to your to-do list. How do I propose you do it?

I could argue by induction: there's always room for one more thing on your schedule.

I could argue along the lines of Hilbert's Hotel: If you just move all the nth things on your to-do list down into the $2n$th position, you've just opened up an infinite amount of odd free time to schedule things into!

I could even argue that our mania for "balancing" different parts of our lives (like balancing teaching and research, or balancing work and family) compartmentalizes them in ways that are harmful to us. As those of you who have brought your kids and other loved ones along to San Diego can attest, it's possible to integrate — rather than merely balance — our personal and professional lives, or our learning and our lunch lives. We can do things differently, instead of just doing more.

But instead of explaining how to do it, I'd like to just add my plea that we do. There are sociologists at our institutions, but I think mathematicians should study sociology. There are artists at our institutions, but we should paint and sculpt. There are economists where we work, but we should read about economics. Here is what economist Kenneth Boulding said about a life of broad intellectual inquiry and curiosity: "It may well be that the only answer to this problem is redundancy, inefficiency, extravagance, and waste." He went on, "One could argue indeed that the main reason for getting rich, that is for economic development, is that it permits the human race to indulge in these last four delights."

Let's all get rich together.

Annalisa Crannell is Professor of Mathematics at Franklin & Marshall College in Lancaster, PA. This is the text of her Haimo Award talk, given at the Joint Mathematics Meetings on January 8, 2008.

HRUMC XV

The 15th annual Hudson River Undergraduate Mathematics Conference will be held at St. Lawrence University in Canton, NY on April 19, 2008. 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 Jeff Weeks, a MacArthur "genius award" winner who will be talking about the shape of space. You can find out more about HRUMC by visiting the conference website http://www.skidmore.edu/academics/mcs/pages/hrumc.htm.

Study the Masters: Using Primary Historical Sources in Teaching and Research

Interested participants from all sections are invited to take part in the 2008 Ohio Section Summer Short Course from Wednesday to Friday, June 18-20, at Xavier University in Cincinnati, Ohio. The facilitators for the course will be Daniel Otero of Xavier University and David Pengelley of New Mexico State, each of whom have almost two decades of experience teaching with primary historical sources at various undergraduate levels and have presented and published extensively in this area. Participants will learn about teaching with primary historical sources in mathematics and will be given the opportunity to prepare some primary sources of their own choosing to use in their classrooms. They will also see how reading, studying, and teaching with these sources can lead to scholarship in history of mathematics. Registration is $175.00. There is a limit of 25 participants. For more information and details about registration contact Daniel Otero at otero@xavier.edu or (513) 745-2012 or go to http://activities.ashland.edu/~ohiomaa/shortcourseinfo08.html.

A Math Circle for Teachers

By Tatiana Shubin

It takes a village to raise a child and it takes the entire mathematical community to help teachers in their quest of teaching mathematics to the nation's children. In August, 2006, the American Institute of Mathematics (AIM), with support also provided by MSRI, launched a program that was to become a model for Teachers' Circles nationwide. Math circles empower students, but Teachers' Circles empower teachers, each of whom can influence thousands of students over the course of a career. In a Teachers' Circle, middle school math teachers get together regularly to solve problems and learn mathematics, sometimes nontrivial and always exciting. The ultimate goal is to change the ways they teach their students by incorporating more high-level reasoning into their everyday classroom instruction, and to discover and pass along to students the excitement and richness of problem solving in deep yet accessible mathematical topics. The Teachers' Circle meetings are led by university professors and other people who know and love mathematics.

In June of 2007, AIM ran a workshop, "How to run a teacher's math circle." Its participants came in seven teams from seven different cities around the country — Salt Lake City, Tucson, Lincoln, St. Louis, South Bend, Boston, and Charlotte. Each team consisted of middle school teachers, mathematicians, and various other key people from the district. These teams were selected from among a pool of applicants on the merit of their strong potential for starting Teachers Math Circles in their hometowns. During the week-long workshop, participants were able to taste the essence of a Teachers' Circle by spending every morning listening to mathematical talks and solving related problems. In the afternoons, participants worked on creating detailed plans of how they would start, run, and sustain their own circles. The organizers and AIM's Brian Conrey and David Farmer helped them by sharing their own experience in all relevant areas, including recruitment of teachers and mathematicians, fundraising, finding a venue, and the like.

This summer, AIM, in partnership with the MAA, is offering two similar workshops: June 16-20, at AIM, Palo Alto, California, and July 21-25, in the Carriage House, MAA, Washington, DC. To take part in this exciting endeavor, find a group of like-minded people and come to one of these workshops to listen, watch, and participate.

Please visit http://theteacherscircle.org/ for more information and an application form.

Adults Learning Mathematics

The 15th annual conference of *Adults Learning Mathematics*, with the title "A Declaration of Numeracy: Empowering Adults through Mathematics Education," will be held in Philadelphia, Pennsylvania, from June 30, 2008 to July 3, 2008. ALM is an international research forum that brings together those engaged and interested in research and developments in the field of adult mathematics/numeracy teaching and learning. The ALM conference has not been in the United States since 2000, so this year offers American educators a unique opportunity to meet colleagues from around the world who share their interest in adult mathematics education. Information about the 2008 conference can be found on the ALM website http://www.alm-online.net. The conference organizer is Kathy Safford, ksafford@spc.edu.

SMURCHOM IV

What it is: The Fourth Annual Smoky Mountain Undergraduate Conference on the History of Mathematics

What it is not: A conference for small blue critters. A conference about smirking.

When: 26 April 2008
Where: Western Carolina University, Cullowhee, NC
Open to: Anyone.

SMURCHOM IV encourages proposals for:

- 15-minute talks by undergraduates on research in the history of mathematics.
- 15-minute talks by undergraduates on research in mathematics informed by its history.
- Posters by undergraduates or graduate students in the history of mathematics or in mathematics informed by its history.

Website: http://paws.wcu.edu/despeaux/4smurchom.html
Contact: Sloan Despeaux, DESPEAUX@WCU.EDU

Free Registration, limited housing available.
This conference is funded in part by NSF grant DMS-0536991 through the MAA Regional Undergraduate Mathematics Conferences program, http://www.maa.org/RUMC/.

Letters to the Editor

Query on Philip Franklin

As a post-graduate student with the Open University in England, I am working on a thesis on "Graph theory in America, 1876 to 1950." One of the scholars featured is Philip Franklin. It appears that there is very little biographical information available on Franklin. I would be extremely grateful if FOCUS readers were able to provide me with such material or suggest where it may be obtained.

David J Parks
dj.ma.parks@googlemail.com

Asking Questions about "Asking Questions"

In the December issue, Wendy Weber asks "How important is the language we use as teachers?" A few lines later, she asks "Why is an inverse function a reflection about the line $y = x$?" This was indeed cause for reflection. Is a function being identified with its graph? Fair enough. But then, it seems that reflection in that line is not an inverse function, rather, it is the operation taking a function to its inverse. This very natural tendency to conflate provides one more "teachable moment."

Robert Seeley
UMass/Boston (retired)

Early College from the Instructors' Perspective

This is in response to the "Dangers of Dual Enrollment" by D. Bressoud, published in the December 2007 issue of MAA FOCUS. We would like to discuss the issue from the point of view of the instructor. Two aspects seem important to us: gradual adaptation of high school students to college learning environment and using college facilities for improvement of teaching. They are crucial factors in preparing high school students to the realities of college life. Such preparation helps them succeed in mathematically intensive college courses.

We have been teaching a sequence of Pre-Calculus and Calculus I in our Early College Program for four years. Our classes were comprised of high school students only and held on college premises. Students were eligible to use college facilities, such as the library, computer rooms, email, and internet services. Both curriculum and final examination were subject to strict departmental control. Enrollment in the program is highly competitive; the typical class has 30–35 students.

We use team teaching to facilitate the resolution of many of the learning problems that a novice college student faces. Among them, more comprehensive and complex courses, faster pace than in high school, more stress on independent study, strict deadlines for assignment submission, and less personal communication between instructor and student. Pairing up a school teacher and a college instructor creates an environment that helps the high school students' adaptation.

College instructional technology provided us with tools for permanent assessment. The typical assessment strategy in mathematics courses at Hostos Community College are "four partial examinations and a comprehensive final examination." Our experience shows that this is not sufficient for high school students. They need a more elaborate assessment scheme. Technological tools allow more flexible assessment; we used *Blackboard* to create online assignments, with automatically generated multiple-choice problems. In regular homework, students can change answers and submit them several times; in "projects," only one attempt is available, and questions are given in random order, one at a time. Both types of assignments have stimulated work in groups.

Besides being an assessment tool, *Blackboard* was used as a source of video classes that were provided by textbook publishers. Video classes facilitated better perception of the material by those students who were slow learners or had problems with specific topics. Our next step will be implementation of lesson-quizzes using clickers that provide automatic collection and grading of students' responses.

Our experience shows that early placement of high school students in the college programs combined with team teaching and a technology-based learning environment raises students' interest in studying mathematically intensive disciplines and results in better preparation for further college study.

Ching Chang
Hostos Lincoln Academy of Science High School

Alexander Vaninsky
Hostos Community College

Quite an Euler Year for Dunham

To celebrate 300 years of Euler's birth, 2007 was named "The Year of Euler." As the author of one of the best known books about the great mathematician, William Dunham has had a busy year, giving over 20 talks on Euler during the year. That works out to one talk every two and a half weeks! Dunham edited *The Genius of Euler,* a collection of articles on Euler and his work, part of the MAA's five-volume Euler Tercentenary Celebration. His own study, *Euler: Master of Us All,* one of the MAA's best-selling books, has just gone into its seventh printing.

Madison MathFest Contributed Paper Sessions

The Mathematical Association of America will hold its eighty-sixth summer meeting, Thursday, July 31 through Saturday, August 2 in Madison, Wisconsin.

The complete meetings program will appear in the April 2008 issue of MAA 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 fifteen minutes. Presentations in the general session will be limited to ten minutes. Each session room will be equipped with a standard overhead projector, a computer projector, and a screen. Presenters are encouraged to use Power Point and if so provide their own laptop or have access to one.

Advances in Recreational Mathematics
Paul R. Coe, Dominican University
Kristen Schemmerhorn, Dominican University
Thursday afternoon

Incorporating Humanities and the Arts into the Mathematics Classroom (and Vice Versa)
Michelle Ghrist, U.S. Air Force Academy
Thursday afternoon

Integrating Biology and Mathematics
James Fulton, Suffolk County Community College
Timothy Comar, Benedictine University
Thursday afternoon

Teaching Mathematics and Statistics Through Current Civic Issues
Rikki Wagstrom, Metropolitan State University
Cynthia Kaus, Metropolitan State University
Thursday afternoon

Projects, Applications and Demonstrations to Enhance a Numerical Analysis or Computational Mathematics Course
Olga Brezhneva, Miami University
David Coulliette, Asbury College
Friday afternoon

How To Get Students to Read the Text and Does This Matter?
Mike Axtell, Wabash College
Joe A. Stickles, Jr., Millikin University
Paula R. Stickles, Millikin University
Friday afternoon

Projects and Demonstrations that Enhance a Differential Equations Course
Shawnee McMurran, California State University San Bernardino
Richard Marchand, Slippery Rock University
Friday Afternoon

Creative Uses of Emerging Technologies for Mathematics Teaching
Lila F. Roberts, Georgia College & State University
David R. Hill, Temple University
Friday afternoon

Actual Problems, Actual Mathematics—Applied Mathematics in Science and the Classroom
William Stone, New Mexico Institute of Mining and Technology
Stephen Davis, Davidson College
Saturday Morning

Interesting Topics in History of Mathematics that Enhance the Teaching and Learning of Mathematics
Daniel Curtin, Northern Kentucky University
Saturday morning

Fascinating Examples from Combinatorics, Discrete Mathematics, and Graph Theory
Suzanne Dorée, Augsburg College
Nancy Ann Neudauer, Pacific University
Saturday afternoon

Innovations in Mathematics Education
Nancy Leveille, University of Houston-Downtown
Carol Vocach, University of Houston-Downtown
Saturday afternoon

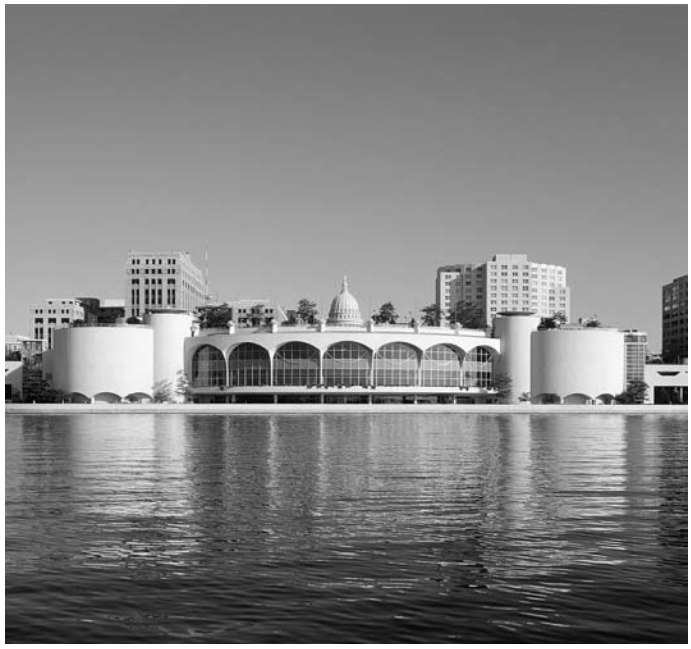
General Contributed Paper Sessions
Sarah Mabrouk, Framingham State College
Thursday, Friday, and Saturday mornings and afternoons

For complete descriptions on each of the Contributed Papers listed above please visit:
http//:www.maa.org/meetings/cps_mf08.html.

Submission Procedures for Contributed Paper Proposals

To submit an abstract for MathFest 2008, go to www.maa.org/abstracts. 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 May 2, 2008. Early submissions are encouraged.



Monona Terrace, Madison, WI.

Call for Student Papers

The deadline for receipt of applications for student papers is Friday, June 13, 2008. 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 (presenters must provide their own laptops or have access to one), and a screen. Presenters are encouraged to use Power Point. Each student talk is 15 minutes in length.

MAA Sessions

Students who wish to present at the MAA Student Paper Sessions at MathFest 2008 in Madison, Wisconsin, must be sponsored by a faculty advisor familiar with the work to be presented. Some funding to cover costs (up to $600) for student presenters is available. At most one student from each institution or REU can receive full funding; additional such students may be funded at a lower rate. All presenters are expected to take full part in the meeting and attend indicated 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 http://www.maa.org/students/undergrad/ by March 1, 2008.

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, 2008 on the PME website http://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.

In Memoriam

Jasper E. Adams, 65, died on November 9, 2007 in Houston, TX. Adams was a Professor of Mathematics and department chair at Stephen F. Austin State University in Nacogdoches, TX. He had been a faculty member at SFA since 1965. Dr. Adams received his PhD from Texas Tech University in 1971.

Richard Ewing, 61, Professor of Mathematics at Texas A&M University, passed away on December 5, 2007. He had served as vice-president of research since 2000 before returning to teaching in August. Ewing received his PhD from the University of Texas at Austin, and held A&M's Mobil Technology Company Chair in Computational Science and was a distinguished professor of mathematics and engineering. He was a member of the MAA for 21 years.

Ralph Mansfield, 95, passed away on December 17. Mansfield was a retired math professor and a textbook author. He had been a member of the MAA since 1941.

Robert Reisel, 82, Professor Emeritus of Mathematics and Statistics at Loyola University Chicago, passed away on November 16, 2007. He received his PhD in mathematics from Northwestern University in 1954. His thesis adviser was Daniel Zelinsky. For the next thirty-eight years, Reisel taught at Loyola, where he advised scores of students who undertook teaching careers in high school or college. His book *Elementary Theory of Metric Spaces; A Course in Constructing Mathematical Proofs*, published by Springer in 1982, was one of the first transition course texts to appear. He was a member of the MAA for 56 years.

Alex F.T.W. Rosenberg, 80, Professor Emeritus from both Cornell and UC Santa Barbara, died October 27, 2007, in his native Germany, after a long illness. He got his PhD in 1951 at the University of Chicago, under Irving Kaplansky, and spent the bulk of his professional life at Northwestern (1952-1961), Cornell (1961-1986), and UC Santa Barbara (1986-1994), publishing about 50 research papers with collaborators including Dan Zelinsky, Samuel Eilenberg, A. C. Zitronenbaum, Jerrold Kleinstein, Gerhard Hochschild, Steve Chase, Roger Ware, Manfred Knebusch, and Eberhard Becker. For many decades, Rosenberg maintained a high profile in both the AMS and the MAA, serving as Editor of the *Proceedings of the AMS* (1960-65) and Editor of the *American Mathematical Monthly* (1974-76). He also served as editor of the Mathematical Problems section in the *Monthly*. He chaired MAA's Committee on the Undergraduate Program in Mathematics in the early 1970s. Rosenberg's 20 PhD students included Vera Pless, Bodo Pareigis, Lindsay Childs, David Dobbs, Bob Morris, Stuart Wang, Tom Craven, Colm Mulcahy and Vicki Powers. Further details, as well as information on a special Cornell University Mathematics Book Fund honoring his memory at http://www.spelman.edu/~colm/alexrosenbergobit.html.

Frances Sullivan, 63, Professor Emeritus at Clemson University, passed away on December 14 after a long struggle with kidney disease. Dr. Sullivan received her PhD from City University of New York. She had been an MAA member since 1980.

M^3 Challenge Expands

Moody's Mega Math Challenge is an internet-based math competition for high school students. The underlying theme of the event is the power of mathematics as a problem-solving tool. This will be the third year for the Challenge. In previous years the competition was limited to students in the New York City metropolitan area; it will expand in 2008 to include metropolitan Boston and Philadelphia and the surrounding areas. Funded by The Moody's Foundation and organized by the Society for Industrial and Applied Mathematics (SIAM), the M^3 Challenge will award $65,000 in scholarships in 2008.

The 2008 Challenge will be held March 8 and 9. Teams of three to five students download the Challenge problem from the M^3 Challenge website, and then work independently for 14 hours to solve an open-ended, realistic, applied math-modeling problem focused on real-world issues. Past topics included "Solve the Social Security Stalemate" and "Beat the Street," which required students to optimize profit from the stock market. More information can be found at http://m3challenge.siam.org.

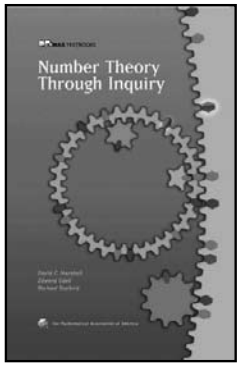
Election for Section Governors in 2008

Voting for the 2008 Section Governors is now underway. Ballots were sent out in early February for the following sections:

Allegheny Mountain
Indiana
Kentucky
Metro New York
Northern California-Nevada-Hawaii
Nebraska-SE South Dakota
Okalahoma-Arkansas
Rocky Mountain
Wisconsin

Members can vote in two ways: using the reply envelope enclosed in their ballot or online. Please go to www.maa.org/voting/sg to vote online. All ballots must be received or cast no later than 12:00 noon EST, Wednesday, March 12, 2007. We encourage everyone to vote!

New from the
Mathematical Association of America



Number Theory Through Inquiry

David C. Marshall, Edward Odell & Michael Starbird

Number Theory Through Inquiry is an innovative textbook that leads students on a guided discovery of introductory number theory. The book has two equally significant goals. One goal is to help students develop mathematical thinking skills, particularly, theorem-proving skills. The other goal is to help students understand some of the wonderfully rich ideas in the mathematical study of numbers. This book is appropriate for a proof transitions course, for an independent study experience, or for a course designed as an introduction to abstract mathematics. This text is suitable for mathematics or related majors or anyone interested in exploring mathematical ideas on their own.

Number Theory Through Inquiry contains a carefully arranged sequence of challenges that lead students to discover ideas about numbers and to discover methods of proof on their own. It is designed to be used with an instructional technique variously called guided discovery or Modified Moore Method or Inquiry Based Learning (IBL). The result of this approach will be that students:

- Learn to think independently
- Learn to depend on their own reasoning to determine right from wrong
- Develop the central, important ideas of introductory number theory on their own.

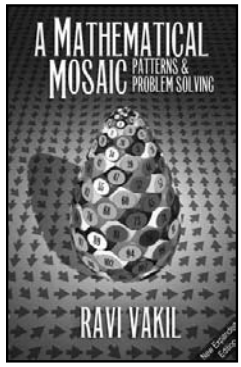
From that experience, they learn that they can personally create important ideas. They develop an attitude of personal reliance and a sense that they can think effectively about difficult problems. These goals are fundamental to the educational enterprise within and beyond mathematics.

MAA Textbooks • Catalog Code: NTI • 150 pp., Hardbound, 2007 • ISBN 978-0-88385-751-9
List: $51.00 • MAA Member: $41.00

A Mathematical Mosaic

Patterns & Problem Solving

Ravi Vakil



New Expanded Edition published jointly with Brendan Kelly Publishing, Inc.

Ravi Vakil, described in the *San Francisco Chronicle* as "a legend in the world of math competitions" has just completed the second edition of **A Mathematical Mosaic: Patterns & Problem Solving.** Regarded by many as a seminal book in the field of mathematics competitions, the first edition of **A Mathematical Mosaic** has received wide acclaim from mathematics teachers, professors and the mathematics community at large.

This book is a must for teachers seeking to challenge their best students, and for students preparing for mathematics competitions.

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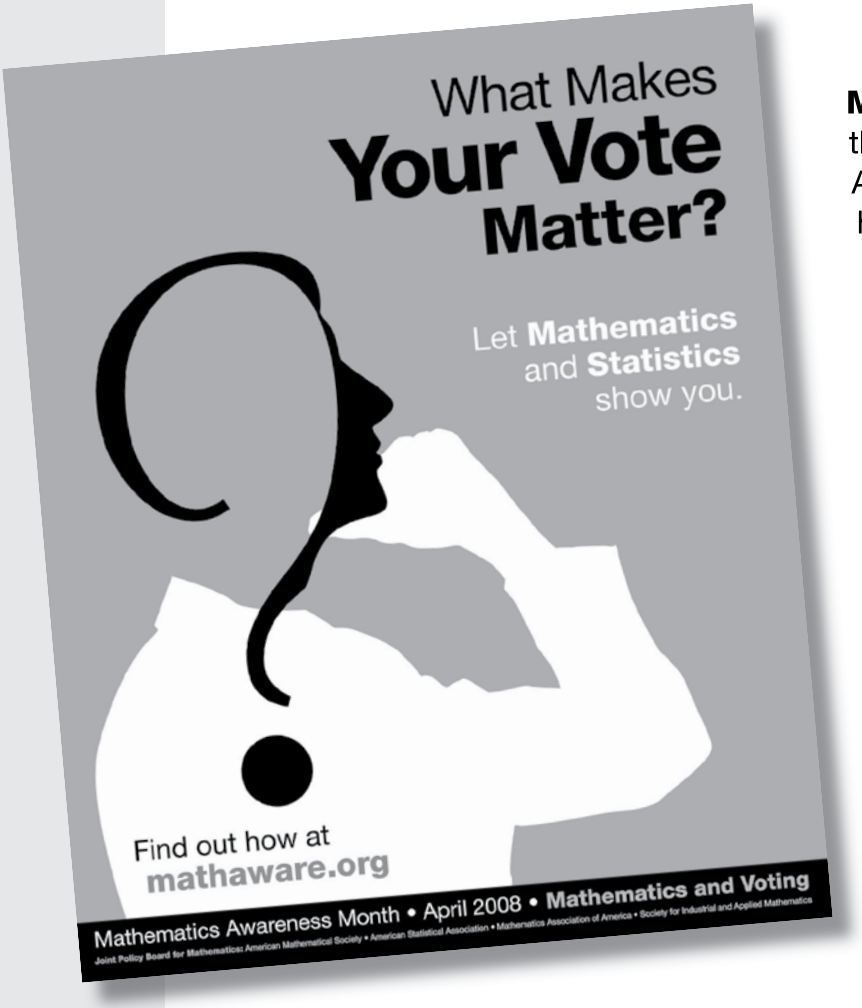
Mathematics Awareness Month

April 2008



Math and Voting is the theme for Mathematics Awareness Month, held each year in April. Its goal is to increase public understanding of and appreciation for mathematics. Visit the Mathematics Awareness Month web site at ***www.mathaware.org*** for details.

Download a copy of this poster at ***www.mathaware.org***.

or

Order a poster for $5; add $1 for each additional poster.
Mail orders may be sent to:

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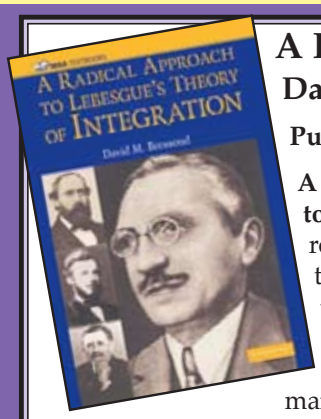
Mathematics Awareness Month is cosponsored by the American Mathematical Society, American Statistical Association, Mathematical Association of America, and Society for Industrial and Applied Mathematics.

The Mathematical Association of America



A Radical Approach to Lebesgue's Theory of Integration

David Bressoud

Published jointly with Cambridge University Press

A Radical Approach to Legesgue's Theory of Integration is a sequel to **A Radical Approach to Real Analysis**. This book is an introduction to measure theory and Legesgue integration rooted in and motivated by the historical questions that led to its development. It stresses the original purpose of the definitions and theorems, and highlights some of the difficulties that were encountered as these ideas were refined. The text begins with Riemann's definition of the integral, a definition created so that he could understand how broadly one could define a function and yet have it be integrable. The story then follows the efforts of many different mathematicians who wrestled with the difficulties inherent in the Riemann integral, leading to the work of the late 19th and early 20th centuries of Jordan, Borel and Legesgue who finally broke with Riemann's definition. In ushering in a new way of understanding integration, they opened the door to fresh and productive ways of viewing many of the previously intractable problems of analysis.

This is not intended to be read as a history of the develoment of anlysis. Rather, it is a textbook informed by history, attempting to communicate the motivations, uncertainties, and difficulties surrounding the key concepts.

MAA Textbooks • Catalog Code: RADL • 320 pp., Paperbound, 2008 • ISBN: 978-0-52171-183-8
List: $39.99 • MAA Member: $32.00

Is Mathematics Inevitable? A Miscellany

Underwood Dudley, Editor

This is a collection of gems from the literature of mathematics that shine as brightly today as when they first appeared in print. They deserve to be seen and admired.

The selections include two opposing views on the purpose of mathematics, *The Strong Law of Small Numbers*, the treatment of calculus in the 1771 *Encyclopaedia Britannica*, several proofs that the number of legs on a horse is infinite, a deserved refutation of the ridiculous Euler-Diderot anecdote, the real story of π and the Indiana Legislature, the reason why Theodorus stopped proving that square roots were irrational when he to the square root of 17, an excerpt from *Mathematics Made Difficult*, a glimpse into the mind of a calculating prodigy….There will be something of interest here for almost anyone interested in mathematics.

Spectrum • Catalog Code: IMI • 340 pp., Hardbound, 2008 • ISBN: 978-0-88385-566-9
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