MAA FOCUS

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WHAT'S INSIDE

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MAA FOCUS

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Inside

On the cover: The graceful curves of the bean-like Cloud Gate in Millennium Park, Chicago produce weirdly distorted reflections. Photo by Joel Haack, University of Northern Iowa.

Launching into the Next Two Years

David Bressoud

This is an exciting and challenging time to be taking on the presidency of the MAA, six years shy of its centennial. The economic situation is difficult. Those of us in academia find our colleges and universities squeezed from many directions. Public funding is drying up. Endowments are taking a hit. Student enrollments are increasing as people enter or stay in college to improve their chances of finding employment or to postpone entering the job market. At the same time, there is greater demand for financial aid. We are all being asked to do more with less.

David Bressoud

The MAA itself is not immune to these economic difficulties. We have always run a lean operation. Even before the financial crisis we were struggling with declining print subscriptions to our journals, a symptom of the broad transition from print to electronic delivery. Our financial reserves, which had come within a whisker of equaling one year's operating expenses, have been set back. We are concerned about whether membership numbers will hold up as our members find themselves under increasing financial strain.

For all of these institutions, the MAA included, this is a time to refocus on the core mission, to think about what is really important, and to direct our resources not just to preserving but to strengthening that which is essential to who we are. The year and a half since my election has been a time of learning about the MAA and coming to understand all it is and all it does. I would like to devote this inaugural column in *MAA FOCUS* to reflections on this core mission of the MAA. Given my own proclivities, I will do this through an historical lens.

The MAA was founded in 1915 to provide a home for *The American Mathematical Monthly*. This and our other journals and publications have always been at the core of who we are, "The preeminent provider of expository mathematics" (from the Vision Statement of the MAA, http://www.maa.org/aboutmaa/visionstatement.html). Immediately following its founding, MAA Sections began to appear, establishing the other central feature of the MAA: This is a grassroots organization that relies on local networks and volunteers.

In the 1940s and '50s, the mission deepened. The MAA took on responsibility for guiding and shaping the undergraduate curriculum, what would become CUPM (Committee on the Undergraduate Program in Mathematics) and eventually encompass other education committees. And the MAA began what would grow into AMC (American Mathematics Competitions), AIME (American Invitational Mathematics Examination), USAMO (USA Mathematical Olympiad), and the training of the U.S. team to compete in the International Mathematical Olympiad. These were natural outgrowths of the original vision. If we are to take seriously our task of sharing good mathematics as broadly as possible, we need to encourage and provide outlets for mathematically talented young people, and we must work to improve the undergraduate preparation of future users of mathematics.

Two other significant and natural expansions occurred in the 1990s. The first was *Project NExT* (New Experiences in Teaching). It was no longer enough for the MAA to provide opportunities for college faculty to get together and guidance in how to make their teaching more effective, it also needed to make a special effort to support, encourage, and nurture new faculty. In the tradition of the original Sections that created local networks, one of the strongest aspects of *Project NExT* has been the formation of cohorts of Fellows who continue to support each other via listservs and gatherings at meetings.

The second new program, officially launched in 2000, was the creation of the SIGMAAs (Special Interest Groups of the MAA), communities built around common interests that, in this electronic age, do not need geographic proximity in order to flourish. I find it very appropriate that the first of these was SIGMAA on RUME (Research on Undergraduate Mathematics Education), a community of people dedicated to the use of research to better understand how we can improve undergraduate education.

This, then, is our core. We are a grassroots organization of many interwoven communities coming together to share our enthusiasm for mathematics with each other and the rest of the world and to sustain each other as we identify and encourage mathematical talent and prepare the next generations who will use mathematics. Our focus always has been and needs to remain on collegiate-level mathematics, but that focus reaches beyond those who are likely to be future members of our communities. It encompasses the preparation and support of K–12 teachers and the education of all college students.

It is a humbling task to take on the leadership of this sprawling and dynamic organization, but, as I said at the beginning, I am excited about these next two years. There are opportunities to build on our many strengths as we provide services to help our members be the very best mathematicians and educators they can be, even in tough times, and to continue communicating the beauty and importance of mathematics.

David Bressoud is DeWitt Wallace Professor of Mathematics at Macalester College and President of the MAA. For an interview with David Bressoud *see page 6.*

Three Years of MAA Reviews

Fernando Q. Gouvêa

In January 2006, the MAA unveiled a book review site called *MAA Reviews*. Initially a part of MathDL, it has since been spun off as an independent part of the Association's online presence. As it reaches its third birthday, the site features reviews of more than 2,100 books. It incorporates the MAA's list of books recommended for library acquisition, which today includes some 1,300 titles.

Three factors came together in 2005. I had been running a book review column on MAA Online, and it was popular with visitors to the site. It was time to think about how to expand and enhance that service. The second component was the decision to stop running *Telegraphic Reviews* in the *American Mathematical Monthly*. The old *TR*s were essentially a database of recent mathematics books, and by moving them online we could cover more books and make the whole thing searchable.

Finally, there was the question of how to update the MAA's list of library recommendations, known to insiders as the "Basic Library List." My Colby colleague Tom Berger was then in charge of this project, and he suggested that the ideal would be to have a large online database of books in which we could simply flag those that we were recommending to libraries.

On the strength of all that, I proposed to Don Albers, then MAA Director of Publications, that we create what is now *MAA Reviews*. It took some time to develop the software. Meanwhile, I started amassing reviews and data. I was then "the secret master of *MAA Reviews*," because I was editing something that didn't yet exist. We went live three years ago with several hundred reviews, and the site has never stopped growing. I owe a huge debt of thanks to the two groups who made this possible: publishers of mathematics books and my batallion of reviewers.

Happily, once we had the site going, most publishers of mathematics books were eager to send us stuff. We record all the books we get. Each book has a page with the basic information and an image of its cover; whenever possible we also post the table of contents. So every book that publishers send to us gets at least a listing. Next comes triage. We would, of course, like to review them all, but that's not really possible. So we designate about half of the books we get as "reviewable." They go to a big table where they sit until someone chooses them.

If the cooperation of publishers is important, the work of our many reviewers is essential: Without it, there just wouldn't be *MAA Reviews*. They're a great crowd of people. Whenever they're ready to do a new review, I send them a list of what's on the "to

review" table, and they choose what they'd like to read. They get a free book, and I almost always get a review.

Reading my reviewers' work is a pleasure. Some of them are masters of compression, writing a couple of paragraphs that capture what needs to be known about the book. Others write longer reviews that tell us about the mathematics in the book or the quirks of the author. Some write very personal accounts of their interaction with the book; others are cool and objective. Sometimes, they will pan a book that I expected them to like. Other times, they will find virtues in a book I didn't really think all that much of. It's a glorious variety of styles, opinions, tastes, and points of view.

I write some reviews myself, of course. There's a special place on the table for books I want to review myself. That pile tends to get big pretty quickly. Then one day I look at it and realize that it's time to send some of them off to other homes. Still, over the years I've managed to review more than 200 books.

We've also run some reviews of "golden oldies." Sometimes a book is reprinted, but at other times a reviewer just feels that an older book really deserves a review. I'd like to see that happen to all the books in the BLL.

Currently, the full *MAA Reviews* is available only to members or subscribers. On MAA Online (bottom of the home page, in MAA Resources), click on the link for *MAA Reviews*, then click on the "Sign In" link. If you are an MAA member, click the "login here" link. On the new screen, enter your UserName (email address) and Password. For a shortcut, click the "members of the MAA" link on the *MAA Reviews* home page at http://mathdl.maa.org/mathDL/19/.

Non-members can also get a taste. Every week, *MAA Reviews* features eight recent reviews on its front page. To see these featured reviews without having to sign in, click on the "*MAA Reviews*" link on the right-hand side of MAA Online's home page or the "*MAA Reviews* (Free Samples)" link under MAA Resources. However, you must sign in to search or access the full database, see the Basic Library List, and obtain information about books that we have received but haven't reviewed.

I've done many things for the MAA over the last 15 or so years. Without question, running *MAA Reviews* has been the most fun. I just wish more members would come and see what it has to offer. If you do, I think you'll find that you'll want to visit us regularly.

In addition to editing MAA FOCUS *and* MAA Reviews, *Fernando Q. Gouvêa is Carter Professor of Mathematics at Colby College. He is sometimes a number theorist, sometimes a historian of mathematics, and sometimes very tired.*

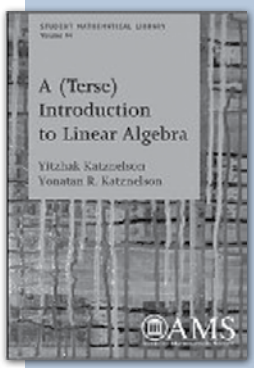
Teasers

Guesstimation: Solving the World's Problems on the Back of a Cocktail Napkin
Lawrence Weinstein and John A. Adam

How many tons of batteries would you need to equal the energy contained in one tank of gasoline? How much farmland would be needed to grow enough crops for ethanol to run all the cars in the US? *Guesstimation* teaches you to find approximate answers to these problems, and many others. (Andrew Ross, April 2008)

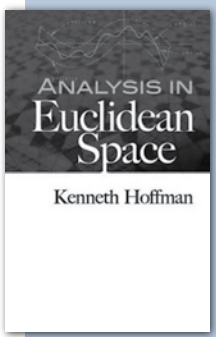
Kiss My Math: Showing Pre-Algebra Who's Boss
Danica McKellar

"Kiss My Math"? What in the world does that mean? According to author Danica McKellar, it means this: "Um, excuse me, I'm going to do whatever I want with my life, and I'm sure as heck not going to let a little math get in my way." (Ezra Brown, August 2008)



A (Terse) Introduction to Linear Algebra
Yitzhak Katznelson and Yonatan R. Katznelson

I believe that this little book could be a perfect guide for that special wunderkind in your vector calculus class, who insists on majoring in engineering but cannot help being interested in mathematics proper. (Gizem Karaali, March 2008)



Analysis in Euclidean Space
Kenneth Hoffman

At times, analysis seems like an arcane, impenetrable bag of magic tricks performed to the initial mystification of the captive audience of students, who are then expected to learn tricks of their own. The familiar and friendly calculation devices from calculus suddenly become trivial by-products of maddeningly abstract, complicated, and alien constructions such as partitions and Cauchy sequences. (Andrew Locascio, January 2008)

An Interview with David Bressoud, MAA President

Ivars Peterson

David Bressoud is DeWitt Wallace Professor of Mathematics at Macalester College. He served in the Peace Corps, teaching math and science at the Clare Hall School in Antigua, West Indies before studying with Emil Grosswald at Temple University and then teaching at Penn State for 17 years, eight of them as full professor. He has held visiting positions at the Institute for Advanced Study, the University of Wisconsin-Madison, the University of Minnesota, Université Louis Pasteur (Strasbourg, France), and the State College Area High School. Bressoud served as MAA's President-Elect in 2008 and is now President of the Association.

Ivars Peterson: Were you interested in mathematics at an early age, or did that develop later?

David Bressoud: It really started for me in seventh grade. I was extremely lucky to have a great seventh-grade teacher who realized I had an aptitude for mathematics. He encouraged me to come in after school, and he gave me good, challenging problems to work on.

> *"The times when I am happiest are when I am working on a book."*

Between my junior and senior years of high school I participated in Albert Wilanksy's NSF summer program at Lehigh University. I grew up in Bethlehem, Pa., so it was easy to get to Lehigh. I remember the program vividly. They gave us great problems to work on. You'd go in for three or four hours every day during the summer and spend the rest of the day just working on those math problems.

I was intrigued by mathematics, and I knew I was good at it. But when I got to college, I wasn't certain I was going to major in mathematics. I was at Swarthmore, so I took lots of different courses in lots of areas. I went through a severe sophomore slump and decided that I wanted to get through college as quickly as I could, so I decided to finish up in three years. Having decided that, I didn't have much choice other than a math major. That was the easiest way for me to get a degree.

IP: After you graduated, you went into the Peace Corps.

DB: I wanted to get out of college. By the time I graduated the one thing I knew I would never do is go back to graduate school. I didn't bother taking the GRE, and the Peace Corps was a great way of getting overseas and feeling like I was doing something useful. It also gave me two years to decide what I wanted to do. So I was in the West Indies on the island of Antigua teaching at the Clare Hall School. I was their first math and science teacher… It was a great experience.

I found that I missed mathematics while I was there. I had stayed in touch with Dave Rosen [from Swarthmore]. He kept sending me problems from the *Monthly*, and I'd taken a couple of my textbooks from Swarthmore… When I decided to do some mathematics on my own, the first thing I did was to solve every single exercise in [Gemignani's book on point-set topology]. That really helped me understand proofs.

I had never taken a course in complex analysis as an undergraduate, so I had picked up a copy of Nevanlinna and Paatero's book on complex analysis. I decided to work out every exercise, but it was so frustrating. I'd read a section and try to do a problem, go back and reread the section to try to figure out what was going on. I made virtually no progress. But when I did go to graduate school and took a course in complex analysis, suddenly all the pieces fell into place. I had done all that spadework in advance to try to figure out what's going on. When I then got into a class it went beautifully for me, and I fell in love with complex analysis.

IP: Once you got to graduate school, your interests went more in the direction of number theory and combinatorics.

DB: They did. My undergraduate record was not that strong. Dave Rosen had suggested that I apply to Temple University and connect with Emil Grosswald. He and Jim Stasheff were the two outstanding mathematicians at Temple at that time. I took that complex analysis class in my first year with Grosswald, so it became natural to follow him. I knew nothing about number theory when I got to graduate school. I really went after the person, not the subject.

IP: What was it about number theory that captured your interest?

DB: I love the simplicity of the questions: how you can compose questions that are so easy to state and then draw on so many different areas of mathematics. That's what I've loved my entire career working in number theory and other related areas of mathematics. You get to see how the different parts of mathematics tie together and how you can get an answer from an unexpected direction. I could tie my discovery of complex analysis to these questions of number theory and see how very concrete questions about the structure of the integers can be answered by doing sophisticated work in complex analysis.

Things like the prime number theorem excited me. So my initial intention was to work in analytic number theory because that's the area that Grosswald worked in. But in my thesis I started moving toward enumerative combinatorial number theory, and that's the direction I took off in.

IP: A lot of your interests now are in the teaching of mathematics. Was that interest there from the start?

DB: Teaching in the Peace Corps was something I loved doing. I realized that at heart I'm a teacher. I also realized during the Peace Corps that I missed higher mathematics, that I would not be happy teaching at the high school level for the rest of my career. When I first went to graduate school, I didn't expect that I'd become a research mathematician. My plan was to get my PhD, and work with future teachers. Then I was bitten by the research bug. That was my focus at Penn State for many years. I was always a good teacher, and I put a lot of attention and effort into my classes, which were important to me. But the research was also there.

There came a point in the late 80s when I realized that staying on the cutting edge of research was more of a drain than a reward for me. I wasn't enjoying having to bring something new to every research conference, and I wasn't enjoying putting together the proposals to NSF or NSA for funding. The search for grants was something that I worried about excessively.

I made a very conscious decision in the late 80s that I would do what I really wanted to do. I was a full professor at this point. I was getting more interested in teaching; I was thinking about how to put together a number theory course that was based on factorization and primality testing. I wanted to write textbooks…

In my last year at Penn State, 1993–1994, David Smith from Duke had a sabbatical there. That was a transformative experience for me. David was so enthusiastic about teaching and had such great ideas about how to do it effectively, to be able to spend an entire year with him was great. We regularly went to lunch together and talked about what was going on in our classes. I was trying out his Project Calc material, then talking over what was happening in the classroom directly with him and getting ideas from him. That's what convinced me that Penn State was not where I needed to be.

I needed to be in a place that had a strong focus on teaching and a community of people for whom teaching was what they were most interested in. And that meant Macalester College. Macalester in many ways was a very natural fit because I knew Wayne Roberts; I had interacted with him through the calculus reform movement. Also, my wife is from St. Paul and her mother just happened to live a mile from the college.

IP: You have done quite a lot of writing, especially books.

DB: It started with my book on factorization and primality testing, which came out of teaching the course. For years I went to the West Coast Number Theory Conference. The people who were working on factorization and primality testing during the 80s all went to that meeting. So I learned a lot about what was going on, and back in the early 80s the methods were very simple. They were methods you could teach in an undergraduate course. So I got the idea of building an undergraduate number theory course around the problem of how you decide if a large integer is a prime or not, and if you know it's not prime how you find its factorization. After teaching the course for a few years, I ended up turning my set of notes into a book.

I found that I enjoyed that, and almost immediately started working on *Second Year Calculus*, looking at vector calculus from a historical point of view… I enjoyed writing that book so much I couldn't stop. I think the times when I am happiest are when I am working on a book, to be able to immerse myself in the research and the writing. I especially love the

rewriting. I like to spend time on how the words sound as well as the structure.

IP: How do you see your role as President of the MAA?

DB: It's a great opportunity to be able to talk about and have some influence on the issues that I care about, in particular undergraduate education. I love the fact that we've got this organization for which the emphasis is mathematics at the undergraduate level, communicating the excitement of this mathematics to a broad audience and thinking about how we can teach it more effectively.

We need to rethink what goes on in undergraduate mathematics. I think we've been tied exclusively to supporting the engineering colleges for too long. There are so many exciting opportunities and challenges out there for mathematics to broaden its involvement with the biological sciences and the social sciences. I want to see that pushed, and this is an opportunity for me to do that.

The complete interview is available online at http://www.maa.org/news/010209bressoud.html.

Ivars Peterson is the MAA's Director of Publications for Journals and Communications.

Call for Proposals

MAA, Tensor Foundation, and SUMMA

Grants are available to support:
Women in Math
Underrepresented Minorities in Math

The Tensor Foundation has provided funding for the MAA to award grants for programs designed to encourage the pursuit and enjoyment of mathematics among female middle school students, high school students, and/or beginning college students, and among those from other groups traditionally underrepresented in mathematics. College and university math faculty and their departments and institutions may submit proposals. They should collaborate with secondary and middle school mathematics faculty, as appropriate. Proposed programs may replicate existing successful programs, adapt components of such programs, or be entirely new.

For more information on grants to support women in math, please write to ffasanelli@verizon.net, or visit:
www.maa.org/tensorwomen.html

For more information on grants to support underrepresented minorities in math, please visit:
www.maa.org/tensorsumma.html

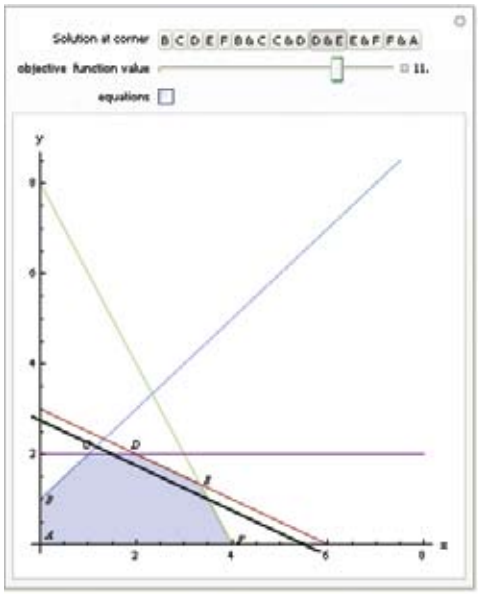
The Wolfram Demonstrations Project

Olivia M. Carducci

I have never felt compelled to evangelize about a mathematical tool before. Oh sure, I love to talk about my research and my teaching innovations, and I like to publish my work so others can read about it. But I understand that not everyone is as interested in my work as I am. However, the Wolfram Demonstrations project is so far-reaching and so exciting that I am spreading the word to everyone I know who has any connection to mathematics. I have barraged my colleagues, my children's teachers, my students, my children, and some of my children's friends. And now I'm writing this article.

The Wolfram Demonstrations project is a web site at http://www.demonstrations.wolfram.com with thousands of *Mathematica*® Demonstrations on an amazing range of topics. A Demonstration is a *Mathematica* notebook that takes advantage of *Mathematica*'s Manipulate command. The Manipulate command makes it astonishingly easy to create sliders or buttons or checkboxes that change the values of parameters in the displays in the Demonstration. The result is a user-controlled animation. The other key to this project was the development of the *Mathematica* Player, which allows those without access to *Mathematica* to run the Demonstrations. This makes the Demonstrations available to my students, high school teachers, elementary school children, in fact anyone with Internet access.

Demonstrations are available on topics ranging from odd and even numbers to odd and even functions, from fractions to fractals, and from linear functions to linear algebra and linear programming. A recent search on "differential equations" yielded over a hundred Demonstrations. A search on "statistics" yielded over 200! In addition to mathematical topics, there are Demonstrations illustrating the time in different cities around the world, global demographic information, and the solar system. There are two different hangman games. The possibilities are endless.



"Graphical Linear Programming for Two Variables" from The Wolfram Demonstrations Project | http://demonstrations.wolfram.com/GraphicalLinearProgrammingForTwoVariables/

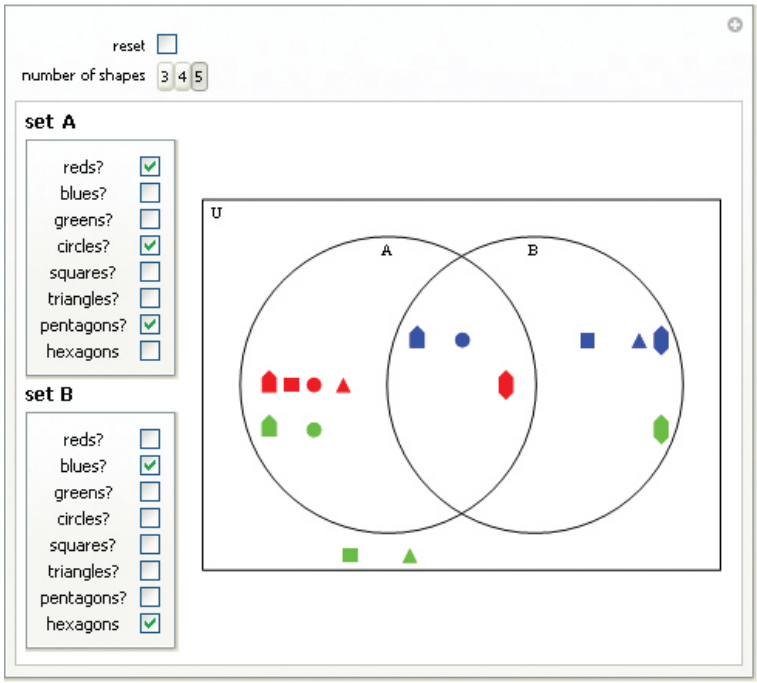
Contributed by: Olivia M. Carducci (East Stroudsburg University)

Demonstrations have given me a new classroom tool. I have used several different Demonstrations to review functions with my calculus I class. (If you want a challenge, try Izidor Hafner's Function Identification Game at http://www.demonstrations.wolfram.com/FunctionIdentificationGame/.) I have used Demonstrations to illustrate probability concepts in my elementary statistics class and to illustrate graphical linear programming in my operations research class. Any time you want to illustrate the effect of changing a parameter, a Demonstration is appropriate and often already available for your use.

At my institution, writing and publishing a Demonstration on the Demonstrations web site is considered scholarly activity. Writing Demonstrations has increased my understanding of *Mathematica*. The Demonstrations team at Wolfram has been very responsive to my questions and comments. The review process is quick and professional. I would like it if they actually told you when they post your Demonstration, but not knowing encourages me to check the site frequently. Searching the Demonstrations web site is a wonderful time waster that you don't have to feel too guilty about. Sure, you're not grading those quizzes, but you're looking for teaching resources.

I learned about the Demonstrations project about nine months ago when I was home with a sick child. I had been receiving messages from Wolfram Research about *Mathematica* 6 web-based seminars, but always felt I was too busy to try one out. That day, however, I had plenty of time on my hands, and I decided to see whether there was a seminar being offered. The only seminar being offered was the Creating Demonstrations seminar. I didn't know what a Demonstration was, but I figured why not; if I don't like it I can drop out. That time filler, on a day that I was stuck at home, had far-reaching consequences for my professional development.

So, put down this magazine, turn on your computer, and go to http://www.demonstrations.wolfram.com. What if you don't? You won't be damned for all eternity, but you will be missing out on a great resource.



"Venn Diagrams for Two Sets" from The Wolfram Demonstrations Project | http://demonstrations.wolfram.com/VennDiagramsForTwoSets/

Contributed by: Olivia M. Carducci (East Stroudsburg University)
Inspired by: Mary Ann Liberatore (Holy Family Elementary School)

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Olivia Carducci is an assistant professor of Mathematics at East Stroudsburg University. In addition, she is a Girl Scout leader, a Cub Scout leader, and a soccer coach. She has spent many hours fiddling with Demonstrations in the last year and hopes you will join the fun.

Hyperseeing

Ergun Akleman and Nat Friedman

The International Society of the Arts, Mathematics, and Architecture (ISAMA) was founded by Nat Friedman in 1998. It was a natural outgrowth of an annual series of Art and Mathematics Conferences held at the University at Albany-SUNY from 1992 through 1997, then at Berkeley in 1998. There were six conferences about art and mathematics during the summer of 1998!

The purpose of ISAMA is to develop interdisciplinary education relating the arts, mathematics, and architecture. It is important to learn to see from multiple viewpoints. One can see a sculpture from multiple viewpoints by walking around it. One can also see mathematical ideas from the viewpoint of art, as well as see art from the viewpoint of mathematics. Hyperseeing is defined as seeing from multiple viewpoints in a very general sense.

Hyperseeing is also the name of the bimonthly publication of ISAMA. It is a free, electronic, full-color publication edited by Nat Friedman and Ergun Akleman that can be seen at http://www.isama.org/hyperseeing/. The purpose of *Hyperseeing* is to highlight artworks that are related either implicitly or explicitly to mathematics. The emphasis is on visualization with full-color images. Although color copies can be downloaded free, high-quality glossy paper copies can be ordered individually from http://www.lulu.com. A detailed discussion of hyperseeing is presented in the first issue, September 2006.

Max Bill, Endless Ribbon, *Granite, 150 x 110 x 120 cm. Pompidou Center, Paris.*

Keizo Ushio, Oushi Zokei Bondi 2007, *Japanese black granite, 170 x 130 x 80.*

Mathematical art can be described simply as art that is generated by a mathematical concept. For example, many sculptures have been generated from the concept of a Möbius band. For mathematicians, there are essentially just two Möbius bands, depending on whether the half-twist is right or left. They are interested in the non-orientability of the Möbius band and in the fact that the right and left bands are distinct in the sense that one cannot be deformed into the other. Sculptors are interested in the variety of interesting shapes that are suggested by the twisted band. For sculptors, there are infinitely many Möbius bands of various shapes and dimensions and made of various materials. The Möbius band *Endless Ribbon* by the Swiss sculptor Max Bill (1908–1994) is granite. Max Bill also made Möbius bands out of brass, copper, and bronze. A variety of Möbius band sculptures by Larry Frazier are discussed in the August 2007 issue of *Hyperseeing*.

It is well known that a Möbius band can be cut in half and will remain a single two-sided band twice as long as the original band. Japanese sculptor Keizo Ushio has adapted this result to carve a series of divided granite bands, such as *Oushi Zokei Bondi*. Keizo Ushio's works are discussed in several issues of *Hyperseeing*.

Arabesque 29, by Robert Longhurst, is based on the Enneper surface. Nat Friedman had visited David and James Hoffman at the University of Massachusetts, and they had kindly allowed him to take photographs of computer-generated images of minimal surfaces. In particular, there were images of an Enneper surface, which Friedman later showed to Robert Longhurst. This led to *Arabesque 29*. The interesting point is that Longhurst mounted the sculpture on a thickened edge rather then presenting the Enneper surface in its standard position. This resulted in a more striking sculpture with surprisingly diverse images from multiple viewpoints, as discussed in recent issues of *Hyperseeing*.

The next ISAMA conference is planned for June 22–25, 2009 in Albany, NY. Visit http://www.isama.org for more information on this and many other resources related to mathematics and art.

Robert Longhurst, Arabesque 29, *Bubinga, 12 x 10½ x 9½ in.*

A New Schedule for *MAA FOCUS*

Fernando Q. Gouvêa

In difficult economic times, we all need to cut back a little. It's the same way with the MAA. For 2009, we plan to have only six issues of *MAA FOCUS*: January, which you are now reading, and then issues dated February/March, April/May, August/September, October/November, and December/January. Each issue will be slightly larger to allow us to provide almost as much content as before. Many of the more time-critical items, however, will be either placed online or included in the MAA's monthly *Math Alert* emails. One bonus is that we can help reduce our carbon footprint by saving on printing and shipping.

The new schedule will, of course, require corresponding changes in due dates for articles and news items. Please see page 11 for that information.

As always, we count on your support, your contributions, and your comments.

Fernando Q. Gouvêa is the editor of MAA FOCUS.
He can be reached by email at fqgouvea@colby.edu.

MAA Financial Information

The MAA invites all members to become familiar with the financial health of the association. Members can log in to reach the MAA Treasurer's Page (at http://www.maa.org/treasurer/) to access current and longer-term financial information about the MAA. The information includes:

1. audited balance sheets for the last three years;
2. pie charts for revenue and expenses;
3. the MAA's investment policy statement;
4. investment fund monthly balances;
5. a list of named funds with a brief statement of each fund's purpose;
6. graphs showing total net assets (1998-2007) and historical income and expense data (1997-2006).

The information is updated each year after the annual audit, usually in May or June.

John W. Kenelly, MAA Treasurer

The Growing Purple Comet!

Jonathan Kane

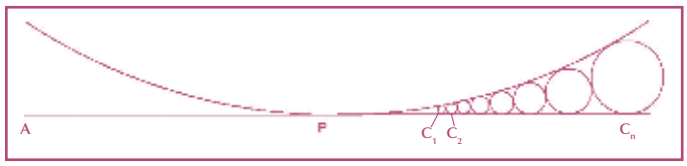
During the week of April 14–16, 2008, over 7000 middle and high school students from around the world logged onto the web site at http://purplecomet.org to participate in the Purple Comet! Math Meet, a free, online, team mathematics competition. This was the sixth running of the contest now co-sponsored by the University of Wisconsin–Whitewater and the University of Texas at Dallas.

Each participating team of one to six students had an adult sponsor who logged onto the Purple Comet! web site and registered the team. Then at any time during the contest week, the sponsor started the team's clock, which allowed the team to view the contest problems and submit answers. For the middle school contest, teams had 60 minutes to work on 15 problems, and for the high school contest, teams had 90 minutes to work on 25 problems.

All problems have non-negative integer answers. Some are fairly routine, such as:

Find the greatest prime factor of the sum of the two largest two-digit prime numbers.

Others are extremely challenging:
Circle B*, which has radius 2008, is tangent to horizontal line* A *at point* P*. Circle* C_1 *has radius 1 and is tangent both to circle* B *and to line* A *at a point to the right of point* P*. Circle* C_2 *has radius larger than 1 and is tangent to line* A *and both circles* B *and* C_1*. For* $n > 1$*, circle* C_n *is tangent to line* A *and both circles* B *and* C_{n-1}*. Find the largest value of n such that this sequence of circles can be constructed through circle* C_n *where the n circles are all tangent to line* A *at points to the right of* P.



Each contest contains several problems specifically designed to be worked by teams of students as they easily break up into sub-problems, which can be assigned to different students.

The contest is the brainchild of three collaborators: Titu Andreescu, former coach of the USA International Mathematical Olympiad team and current director of AwesomeMath, Jonathan Kane, regular contributor to the American Invitational Mathematics Exam, and Bennette Harris, web development expert. The contest originated in 2003-2004 when Andreescu spent a year in Whitewater as a visiting scholar. For each contest Andreescu and Kane write the problems and Harris maintains the web engine that handles team registrations, presents the contest, collects, scores, and displays the results.

The contest's team format, online delivery, round-the-clock availability, ease of registration, and zero cost make the Purple Comet! Math Meet stand out as unique among academic competitions. Because the competition is free, many teachers register multiple teams; some even arrange for all of their students to participate. The team format encourages students to discuss problem-solving strategies and time management, which makes the contest more appealing to groups of students traditionally less interested in individual competitions. The full 24-hour availability of the contest during the contest week allows teams to participate before, during, or after school or during math circle activities on the weekend. This also allows for international participation, and students from 13 countries participated in the 2008 contest.

Plans for the future of the contest include providing translations of the contest problems into several languages, providing automated award certificates and certificates of participation to the students, expanding the contest week to include weekend days, and allowing teams of students (or adults, for that matter) to practice by working old contests under normal competition conditions. The next contest is scheduled for a full week starting at midnight UTC (Greenwich time) on Monday morning April 27 and running through midnight UTC on Sunday night May 3, 2009.

Jonathan Kane is Professor of Mathematics at the University of Wisconsin–Whitewater.

MAA National Elections 2009 Go Green | *Make Sure You Participate!*

Email Only and Paper Ballot By Special Request

All members for whom the MAA has an email address on file by February 20, 2009 will receive an email ballot only. This email ballot allows for direct voting. It is personalized and no specific login is necessary. A member for whom the MAA does not have an email address on file by February 20, 2009 will *not* receive an email ballot and will receive a paper ballot *only if the member has specifically requested it.*

Does the MAA Have My Email Address?

If you receive the monthly e-newsletter *Math Alert*, then the MAA has your correct email address on file. This e-newsletter is usually sent to members in the middle of each month. If you do not receive *Math Alert*, this means that the MAA probably does not have your (correct) email address on file.

Checking or Adding Your Email

All members can update their personal contact information by following these steps:

1. Go to http://www.maa.org/myaccount.
2. Log in using your User Name and Password.

Your User Name is your email address unless you have changed it. If we do not have an email address on file for you, your User Name will be your eight-digit Member Number including the leading zeros. If you have forgotten your password, please use the Forgot Password link. Questions? Contact MAA Membership Services at (800) 331-1622 (U.S. only) or (301) 617-7800 (outside the U.S.) or via email at *maaservice@maa.org.*

3. Once you have logged in, you can add or edit an email address by going to Communications Methods at the bottom of the page and adding or editing as you wish.

Please note that your email address appearing in the *Combined Membership List* (CML) does not necessarily mean it is included in the MAA database.

Requesting a Paper Ballot

Members who wish to request a paper ballot must do so by February 20, 2009 through one of the following methods:

4. **Email**: Send an email with your name and address to elections@maa.org.
5. **Mail:** Write your request, including your name and address, and send to:

   MAA National Elections 2009
   1529 18th Street NW
   Washington, DC 20036

6. **Fax:** Fax your request to (202) 387-5948. Be sure to include your name and address.
7. **Phone:** Call the MAA front desk at (800) 741-9415 to be connected to Calluna Euving or Susan Kennedy. Please leave your name and address with either of them.

Questions and Information

The ballots will be sent out in early April. The elections run through April and May. Should you have any questions or concerns, please contact Calluna Euving or Susan Kennedy at the MAA headquarters.

Email: elections@maa.org

Phone: 800.741.9415 or 202.387.5200

Fax: 202.387.5948

Mail: MAA National Elections 2009
1529 18th Street, NW
Washington, DC 20036

Undergraduate Research: How Do We Begin?

Brad Bailey, Mark Budden, Michael Dorff, and Urmi Ghosh-Dastidar

"How do you begin to do undergraduate research?" This is becoming an important question as more and more mathematics professors and their institutions want to provide an undergraduate research experience for their students. In this article we provide some strategies for guiding undergraduate research that were shared by the participants of the 2008 Center for Undergraduate Research in Mathematics (CURM) workshop at Brigham Young University in Provo, Utah.

Like effective teaching, successful undergraduate research is based upon foundational ideas that should be adapted and expanded to fit the talents of the professors and the needs of the undergraduates.

Get students interested. A good visual aid can help students become interested, even enthusiastic, about a problem. For example, one faculty member uses soap bubbles on wire-frame cubes to illustrate minimal surface areas. Students might not be willing or able to tackle hard problems at first, but making their introduction to the project fun and exciting can make them more committed to overcoming the hard work that lies ahead. Ideally, they will start taking the initiative to solve more difficult problems on their own.

Present background material. The time a professor spends presenting background material depends upon the research topic. However, if a professor spends too much time, there will be little time for doing research. Generally, we find that the presentation of background material should not exceed 25% of the time.

There are several approaches to presenting the material. Some professors choose to prepare a set of notes for their students. They provide these notes to the first group of research students and extend or expand the notes each year with each new group of students. As it is important to carefully and accurately prepare anything the professor gives to his students, writing and revising such a set of notes may be very time consuming. However, one potential long-term benefit is that these extensive notes may become early drafts of a book or part of a book that the professor later intends to publish.

A second approach is to give the students articles to read. Some of the more experienced members of the workshop noted that research articles are written for professionals working in a given field and often lack details or allude to previous work within the field. Because of these facts, a student trying to read a research article may flounder and then become discouraged or disinterested in the project. The advisor may rewrite the article or parts of it to make it accessible to the students.

Another possible solution includes using primarily student-level journals, or material from books, which provide a sufficient amount of background. Entire books are usually too much for undergraduates to read within the time constraints of an undergraduate project. Instead, the students could be asked to read specific pages or sections of some selected textbooks that contain information pertinent to the students' research.

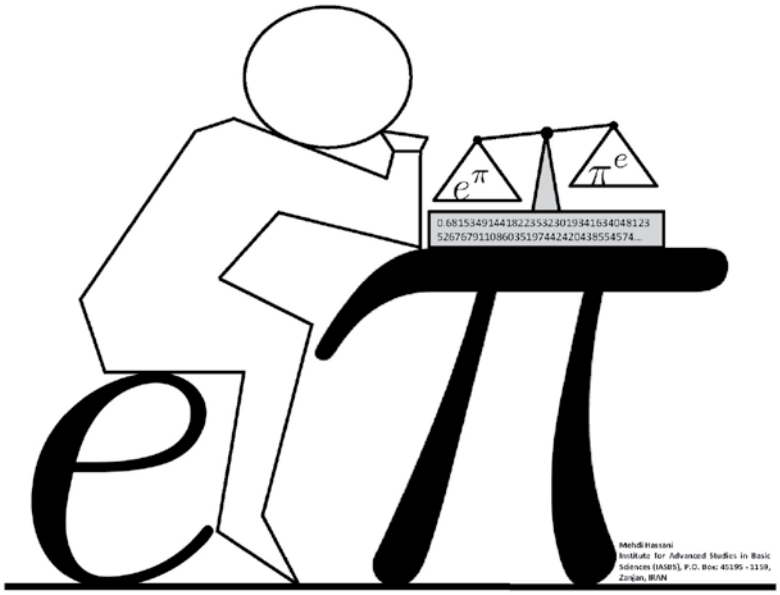
Work out details with the students. Meeting with the students and reading the article together helps develop students' ability to work independently. In this joint faculty-student reading session, the professor may question the students about what was read. It is important to emphasize that it is okay if students do not understand everything the first time. Depending on what the mentor's intent is for the students to gain from this process, the professor may emphasize different aspects of the article. For example, the faculty may want the students to learn a particular proof technique, or he may want them to understand certain theorems.

As the professor and students read over a theorem, some of the following questions may arise. Can you think of an example that illustrates this theorem? What purpose do the hypotheses of the theorem serve? If the theorem is not bi-conditional, is its converse true? For many theorems, this process helps the students understand the meaning of the theorem's statement. If some of the hypotheses are unnecessary, this could provide a possible avenue for students to explore. Otherwise, students may search for a counterexample.

Problem solving. The students should start working on basic problems early, and then dive into exploratory problems as soon as possible. Starting the students off at the basic level and allowing them to explore the area develops their background in the field. This can also help build students' confidence, enabling them to work more independently.

While it may be tempting to give students the whole problem at the beginning of the project, this may overwhelm and discourage them. Instead, over the course of time, the mentor may choose to give them several small problems that are part of a larger project, or even a series of problems that build or lead toward the project's goals. This process of problem solving provides students the insight to formulate and prove a theorem.

For example, if one of the goals of the project is to prove an existential theorem, the advisor may start with the students working in a simplified setting in which they can actually find or solve for the "object" that exists, thus giving the students the opportunity to realize that these "objects" always exist (or exist under certain conditions). This approach will lead them to discover, and ultimately prove, the result they were looking for.



Pondering

Develop student independence.

Continuous encouragement to pursue new avenues promotes student independence. Many students will be resistant to doing something new or something they are not "good" at. In one example given by a faculty member, the professor had a group working on a problem in discrete mathematics, and the students were making decent progress early on. However, after a week or two, the results stopped coming. He repeatedly urged the group to write a computer program to aid in solving the problem, but the students were extremely resistant. The faculty member was persistent and convinced them to write the code, after which, they gained the necessary insight to reestablish their progress.

Preparing a list of expectations and presenting it to the students in the beginning of the research period is also beneficial. For example, the professor may want the students to know LaTeX well enough to write up their findings and effectively communicate with the research group via e-mail. The faculty member may also urge students to type their results as they work. This forces them to think carefully about their notation as well as the wording and logic of their proofs. It frequently leads to stronger, more eloquent proofs and can generate more research avenues. At the end of the project, these notes can be compiled into a final paper. Since the paper was prepared slowly over a long period of time, the overall quality will be higher than if the students waited until the end to write up the results. Regular presentation of their results, either to the advisor or to the entire research group also advances their confidence level and communication skills.

Moreover, the list of expectations may also include the average amount of time per week that each student is expected to commit to the project. The mentor may require his students to submit a brief report each week about their work and findings for that week. Writing such reports not only benefits the students, it also provides the professor insight into the students' understanding of the process.

Student frustration.

At times, students may feel they are no longer making progress and become frustrated. Students should be told in advance that this will occur — that frustration is okay and happens to everyone. In trying to overcome frustration, the advisor may choose to work through hurdles with them, asking questions along the way. It is important that they become involved in this process and not just reply "yes, I understand" to the professor's questions. They should be able to explain their answers and their understanding of the important concepts and techniques. If the research problem is too complex for the student to solve, the professor may provide a simpler version of the original problem.

The research problem.

As the mentor has worked through the previous steps, it is probably useful to point out potential research problems. For example, while reading through an article with the students, the pro-

fessor may ask them "I wonder what would happen if we changed this condition. This could be a good research problem for you to explore." Once the students are ready to start working on a specific problem, this collection of potential research problems could be presented, and the students could choose which problem they would like to work on.

If appropriate, the students could work on a problem using more than one approach. For example, the students could use analytical techniques as well as computer simulations. If a student attempts to determine the validity of a conjecture, it may be insightful for them to alternate between trying to construct a counterexample and working on a proof.

Finally, it is beneficial for the students to compile their work and write a final report on whatever research they have done, even if they have only partial results. Communicating mathematics is an important skill, and writing about their work helps students improve this skill. Also, it brings a sense of closure to the project. In the end, be certain that your students have a positive experience. Point out how much they have learned and the significance of their work. Make sure that they are proud of their accomplishments and that they know that you are, too.

This workshop was run by the Director of CURM, Michael Dorff, (mdorff@math.byu.edu) *Brigham Young University. Authors for this piece comprise: Brad Bailey* (bbailey@ngcsu.edu) *North Georgia College & StateUniversity, Mark Budden* (mark.budden@armstrong.edu) *Armstrong Atlantic StateUniversity, and Urmi Ghosh-Dastidar* (ughosh-dastidar@citytech.cuny.edu) *NewYork City College of Technology.* *CURM is supported by the NSF grant DMS-0636648.*

"The Pea and Sun"

by Lawrence M. Lesser

(This may be sung to the tune of George Harrison's "Here Comes the Sun")

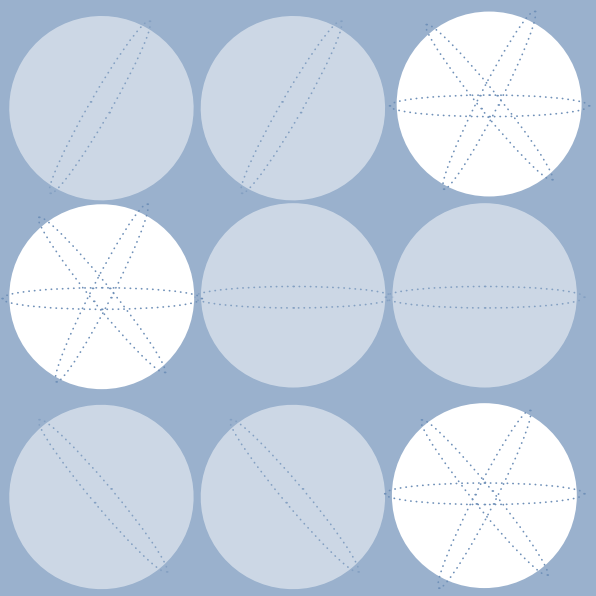
Banach-Tarski — come break a ball into six pieces:
Reassembled — that first ball sure increases!

The pea and sun,
A 2-for-1, and I say, it's all right.

Banach-Tarski — it is a mathematics wonder:
Banach-Tarski — could it maybe end world hunger?

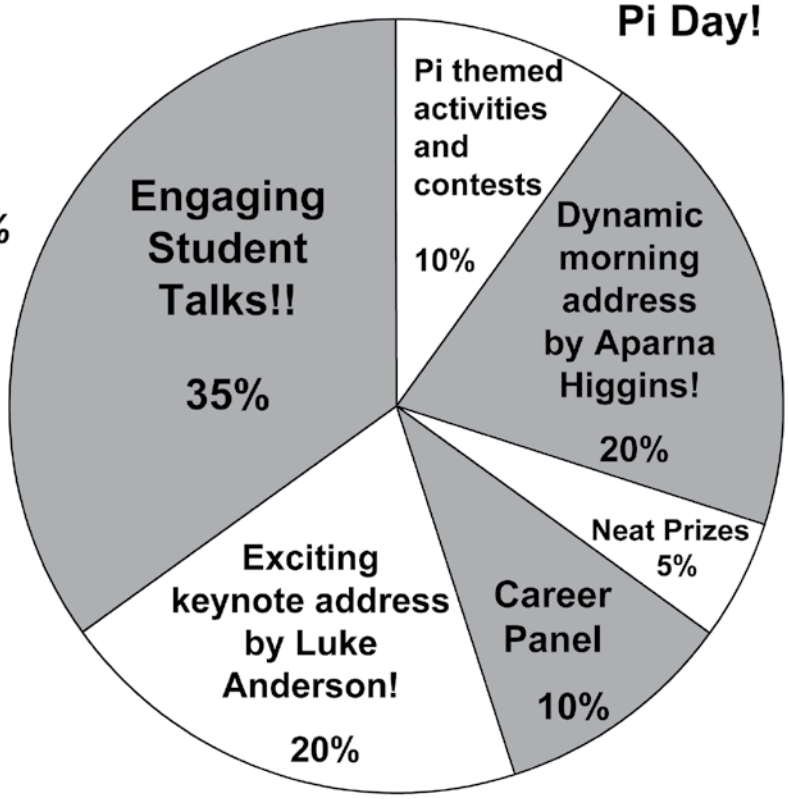
The pea and sun,
A 2-for-1, and I say it's all right.

Words ©2005 Lawrence M. Lesser



Pacific Coast
Undergraduate Math Conference

University of California, Riverside
March 14, 2009
Pi Day!



Registration fee 0%

Lunch fee 0%

Inaccessible math talks 0%

Travel funding is available!!

Funding Deadline:
February 21, 2009

Register online:

www.pcumc-math.org

Registration Deadline:
March 7, 2009

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

MAA FOCUS Deadlines (new schedule)

	April/May	August/Sept	Oct/Nov
Editorial Copy	February 15	June 16	August 15
Display Ads	February 22	June 23	August 29
Employment Ads	February 15	June 16	August 15

How Not to Blow the Interview

Robert Vallin

Okay graduate students, this one is for you. Let's talk about the job hunt. Of course, I have the secret to a successful job search, but I've been sworn to secrecy. So you'll just have to make do with some general comments and ideas to help you along the way.

To begin with, get ready to do some mailing. We've all heard stories about people who sent out five applications because those were the only schools they were interested in *and* they got the job they wanted. However, those are the exceptions, not the rule. Before I get hate mail from search committees, let me clarify that I am *not* suggesting that you should send off applications everywhere, even if you aren't what they're looking for or you don't want to be there. I am saying that you need to be prepared to send out a lot of packets to get a good result.

If you'd like some advice on your application materials, read the *FOCUS on Students* column from October 2007. (Back issues of *MAA FOCUS* are online at www.maa.org/pubs/pastissues.html) In this article I want to concentrate on what happens after your materials have been reviewed and you make it to the interview process. There are three interviews that I'll highlight: the phone interview, the Joint Mathematics Meetings interview, and the on-campus interview.

The Phone Interview

To begin with, the phone interview is scheduled in advance. It is not an ambush. You will most likely be contacted via email for times that will work for you (it will probably require about half an hour). The hiring committee will contact you with a day and time that they wish to talk to you.

What does this mean? It means they are interested in you and want to see how you handle yourself in conversation and get some preliminary questions answered. Relax about this, but remember it is a job interview, so be professional and be prepared. Acquaint yourself with the school (you don't have to memorize everything, but don't get caught unprepared). What type of school is it (research versus liberal arts versus small state school, etc.)? Where is it located (small town, inner city, sprawling suburban campus)? What type of research is done there? Mention someone at the school whom you are familiar with (this does not mean know intimately, it means you can say, "I noticed Professor Smith is very involved with student research. I would like to be involved with that, too.").

Other questions you will be asked range from the wide open ("What do you know about our university?") to the very specific ("Do you have much experience dealing with non-traditional students?"). The search committee is hoping you might be the person they want, and they're likely to ask questions that reflect what they think will fit their needs.

You are, of course, expected to ask questions, too. You are also "interviewing" them, deciding if this is a place where you could be happy. Now is not the time to bring up money, or insist that you will not teach in the morning, but you can ask what type of classes you are likely to have, or if they are interested in your teaching style (you might use writing more heavily than most people, for example). You'll want to know how many students are typically in a class and how much service work (committees, student recruitment, etc.) you would be expected to do.

Remember, the committee is calling you because they are interested in you, so don't get too stressed out. On the other hand, they are interviewing you, so be friendly, but don't forget this is business. The story is still told about the phone interviewee who, when asked if he had been to the campus calling him, said, "Oh yeah, I've been there to a weekend party. It's a lot of fun." Once said, the silly statement cannot be taken back and can have a big influence on your chances.

The Joint Mathematics Meetings Interview

The JMM interview is an altogether different creature. Here you are one of many candidates the committee will be interviewing, and they are one of many schools you will be meeting with. It can be exhausting on both ends. There are no sage words of advice for how to make the top of everyone's list. That said, there are some things you can do to avoid being taken off anyone's list.

Let's begin with the obvious but overlooked part: meeting your interviewers. Give a firm and confident handshake, look the person you are meeting in the eye, and smile. I know you're exhausted, I know you're under pressure, but these niceties are part of normal social interaction. It's better to be safe than sorry, so when addressing someone use their title until they say otherwise ("Please, call me Dave.").

You should have something to say about their department. Use *Google* or the guides to colleges that are placed in the waiting area to look up the school if you have to. You want to show them that you are interested. I'm not saying you have to know everything, but know something ("I'm really intrigued by your Undergraduate Seminar," or "I see you take students to the Section Meeting every year," means a lot). Be prepared to talk about yourself and your thesis, but be able to do it in a succinct manner. The people you are talking to will probably not be specialists in your field. If you cannot give a short description, talk to your thesis advisor and brainstorm a way to do so. Be cautious that jargon and buzzwords that don't mean anything will be sniffed out right away.

Finally, let's talk about teaching, because they will expect you to talk about it. Most of your interviews will not be with "Research I" schools, so teaching will be a big concern. Make sure you talk about more than how you are so excited to teach all their upper-level classes. You will be expected to teach a wide variety of courses. Usually that will include calculus or other first-year courses. Be prepared to talk about these lower-level courses. You should have some idea about what you want to say when the subject comes up. You need to think about what you would do to keep the class engaged when you know they wish to be elsewhere.

The On-Campus Interview

Congratulations, you've made it on to the really short list! Now what? Typically, you receive a phone call asking if you can come for an on-campus interview. You will meet the entire faculty, the Dean, perhaps someone in Human Resources, and quite probably some students. Also, some combination of research talk, student talk, and classroom lesson will be expected of you. The first two should be prepared well ahead of time since they are standard during interviews. The last you will have time to prepare, but cannot work on it until they tell you the subject. For more information on giving your best talk, see the article by Michael A. Jones and Karen Saxe in the November 2007 issue of *MAA FOCUS*.

As before, do some research on the school. Find out who is there, what their interests are, and how they intersect with yours. Look at the catalogue and see what classes they offer. Be prepared to answer questions such as, "We teach a lot of courses for elementary education majors. What do you know about such courses?" It's okay to say, "I've never taught one, but I looked at the description on the web site and know I could do it." It's not okay to say, "Eeeuw, I don't think I would like that." (As far-fetched as that sounds, such statements do get made.) If this school is not a place where you would like to teach, then you're wasting everyone's time.

Knowing about the school will also help with some of the toughest questions you'll face from the students. Many departments, especially the smaller ones, will have a group of students meet with you privately or take you to lunch. Students don't always get a vote, but attention is paid to their impressions. After all, a lot of your career is spent working with them. Try to find out what the departmental culture is like in this respect. In some departments, students will try to find out whether you are friendly and approachable. In others, they will want to know whether you can excite them mathematically. And at some places, the question will simply be whether you care about teaching or will just focus on your research.

On to the details: Who pays for your trip? They do, but usually it's as reimbursement, so you'll have to pay for your flight and parking at the airport and then submit the paperwork. Yes, this creates a cash flow problem, so be prepared. It may be possible to drive to an interview. Then you'll be reimbursed at the standard rate. If they ask you to book your own travel, be careful: If you live 200 miles away and decide to fly for $500, it can look like you're not really paying attention and are being wasteful. They will pay for a hotel room or put you up in a private room in a residence hall. Also, meals are on them (but keep in mind that you are still being interviewed during the meals).

There is debate about thank you notes. You don't really have to send one, but a nice email to the chair of the committee giving thanks for making you feel welcome is a nice thought and keeps you on their minds.

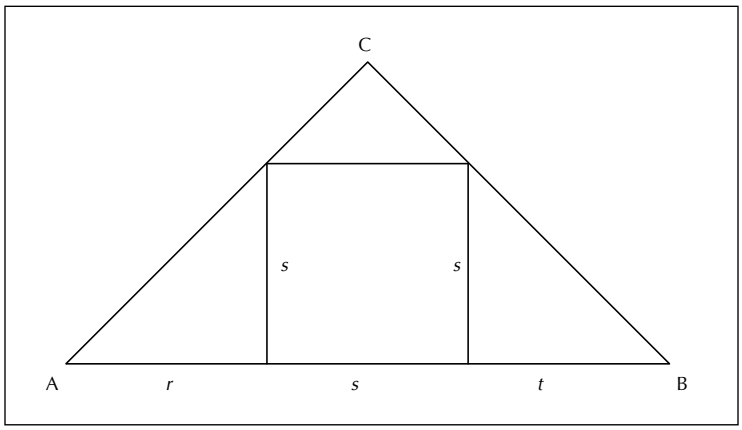
One last thing, which may at first reading seem impossible: Relax and try to enjoy the process. They are interviewing you, but everyone wants you to be the person they will hire, and so they want you to do well.

Robert Vallin is Professor of Mathematics at Slippery Rock University and MAA Associate Director for Student Programs.

On Shutting Up and Listening

David M. Bradley

As a follow-up to David Kung's January 2008 *MAA FOCUS* article, "What I Learned from…Shutting Up and Listening," I present here the results of a similar experiment in my senior capstone seminar held this past spring semester. Like Kung, my intention was to have the class struggle with the problem of inscribing a square in a triangle as described and worked out on pages 23-25 of the second edition of *How To Solve It: A New Aspect of Mathematical Method*, by G. Pólya. I was surprised that none of my students arrived at the usual solutions based on the Intermediate Value Theorem, nor did they duplicate any of the solutions found by the students in Kung's class. Instead, three quite different solutions emerged.



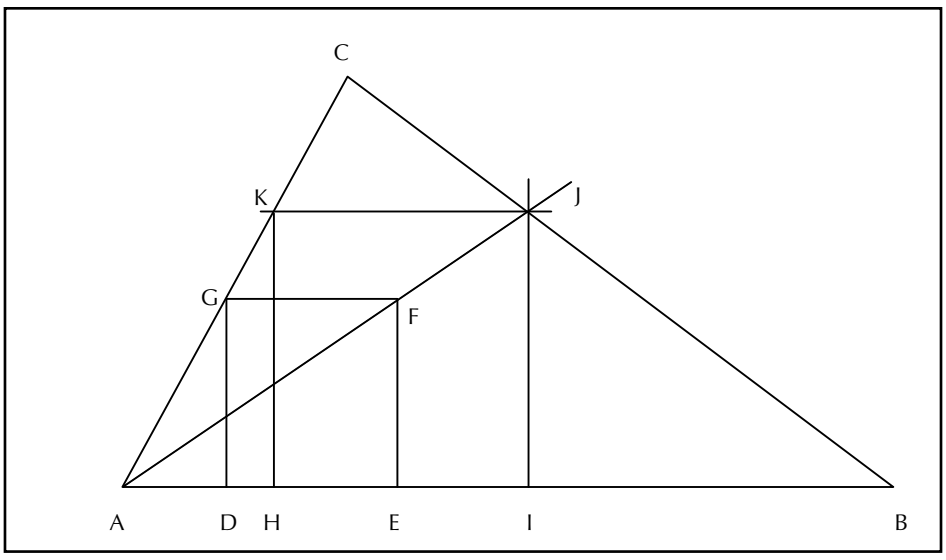
A Problem of Construction

Inscribe a square in a given triangle. Two vertices of the square should be on the base of the triangle, the other two vertices of the square on the other two sides of the triangle, one on each.

Dale's solution is based on similar triangles. It recalls one of the solutions based on the Intermediate Value Theorem, but rather than inferring the existence of the inscribed square, an explicit construction is provided.

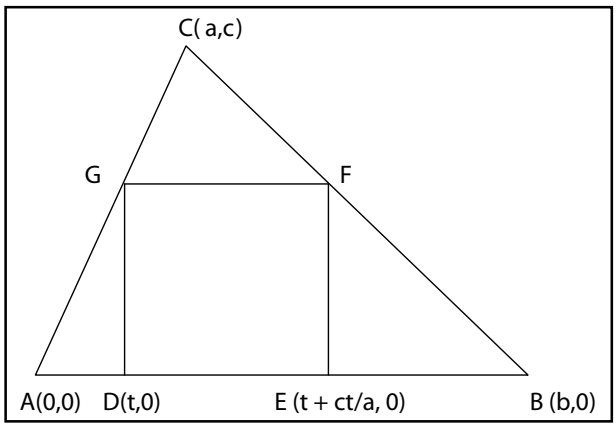
Given triangle ABC, we again suppose that angles A and B are acute. Choose points D and G on sides AB and AC, respectively, so that the square $DEFG$ has base DE on AB and the point F is an interior point of the triangle. Join points A and F with a straight line segment, extending the segment to meet CB at J. Drop a perpendicular from J to meet AB at I. Draw a line segment perpendicular to IJ through J, meeting AC at K. Drop a perpendicular from K, meeting AB at H. We claim that $HIJK$ is a square.

To see this, observe that triangles AIJ and AEF are similar. This implies that $IJ/EF = AJ/AF$. Since triangles AJK and AFG are also similar, we also have that $JK/FG = AJ/AF$. It follows that $IJ/EF = JK/FG$.



Erroll's solution is based on trigonometry. Given a triangle ABC, since the sum of the positive angles is $A + B + C = \pi$, it is easy to see that two of the angles must be acute, say $0 < A < \pi/2$, $0 < B < \pi/2$. Let c be the length of the side AB opposite angle C. We need to exhibit positive r, s, and t satisfying $c = r + s + t$ and such that a square erected on the base s is in fact an inscribed square.

To do this, let $\alpha = \tan A = s/r$ and let $\beta = \tan B = s/t$. Then $r = cr/(r + s + t) = (cs/\alpha)/(s/\alpha + s + s/\beta) = c\beta/(\beta + \alpha\beta + \alpha)$, $t = ct/(r + s + t) = (cs/\beta)/(s/\alpha + s + s/\beta) = c\alpha/(\beta + \alpha\beta + \alpha)$, $s = c - r - t = c - c\beta/(\beta + \alpha\beta + \alpha) - c\alpha/(\beta + \alpha\beta + \alpha) = c\alpha\beta/(\beta + \alpha\beta + \alpha)$. Since r, s, t evidently satisfy the required conditions and are expressed in terms of only the tangents of the given angles A and B, the problem is solved.



Cross-multiplying shows that $IJ/JK = EF/FG$, which is equal to 1 since $DEFG$ is a square. It follows that $HIJK$ is also a square.

Sarah's solution employed coordinate geometry. Given a triangle ABC, assume again that angles A and B are acute. Without loss of generality, we may suppose that the Cartesian coordinates of the points A, B, and C are given by $(0, 0)$, $(b, 0)$, and (a, c), respectively, where $0 < a < b$ and $c > 0$. Now choose t satisfying $0 < t < a$ and locate the point D on AB so that D has coordinates $(t, 0)$. Next, locate the point G on AC so that DG is perpendicular to AD. Since the line extending AC has equation $y = cx/a$, G has coordinates $(t, ct/a)$. Since we want a square with one side DG, the next step is to locate the point E on AB so that $DE = DG$. This implies that E has coordinates $(t + ct/a, 0)$. The fourth vertex, F, of our square is located at the intersection of the horizontal line through G and the vertical line through E. Therefore, F has coordinates $(t + ct/a, ct/a)$.

It remains to show that there exists a value of t such that F lies on CB. Since the line extending CB has equation $y = (x - b)c/(a - b)$, we need to ensure that the coordinates of F satisfy this equation. It suffices to show that the equation $(t + ct/a - b)c/(a - b) = ct/a$ has a solution t that satisfies the original stipulation $0 < t < a$. Middle-school algebra reveals that the equation has the unique solution $t = ab/(b + c)$. Since $0 < b/(b + c) < 1$, we see that $0 < t < a$, as required.

David M. Bradley is associate professor and graduate coordinator in the Department of Mathematics and Statistics, University of Maine, 5752 Neville Hall, Orono, ME 04469-5752. He can be reached at bradley@math.umaine.edu or dbradley@member.ams.org .

Egypt Awaits You

Travel with the MAA on its 7th Annual Mathematical Study Tour

May 20 - June 1, 2009

Ancient Egypt will surround you with all of its fascination and intrigue while we experience the splendors of Giza which includes the Great Pyramids and mysterious Sphinx and learn of the mathematical genius that was involved in building such structures. A lecture by Dr. Zahi Hawass, Secretary General of the Supreme Council of Antiquities and Director of the Giza Pyramid Excavations, will begin this incredible journey.

We will gain insight into Cairo's religious past, including visits to the oldest Christian church in Egypt, the Ibn Ezra Synagogue, and the Alabaster Mosque. A visit to the Egyptian Museum of Antiquities will bring us face to face with the mask from Tutankhamun's gold and precious stone encrusted mummy that no longer is allowed to exhibit outside of Egypt.

The magnificent temples of Karnak are an impressive example of how mathematics was used to lay out the colonnades which provides the rising sunbeams the appropriate angles for the first rays to illuminate the holy places of the temple. Navigating the Nile River will bring us to Edfu and Kom Ombo where the carvings on the temples of Sobeck and Haroeris are believed to be one of the first representations of a lunar calendar. Our tour will include Alexandria, where Hypatia, the first woman to make significant contributions to mathematics, headed the Platonist School and assisted her father, Theon of Alexandria, the mathematician and philosopher.

Jim Ritter, our expert throughout the tour and professor at the Université of Paris, will show us the different ancient Egyptian systems of measure that are evident at Ny-ankh -Knum and Khnum-hotep (the two brother's tombs) in Sakkara.

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202-293-1170

Found Math Photos Spot Math Where Many Don't

Ryan Miller

A six-petal flower, a spiral staircase, a manhole cover shaped like a Reuleaux triangle, Chicago's "bean" sculpture, a dodecahedral water tower, a fractal vegetable or tattoo. What do they all have in common? They've all been *Found Math*, and they prove that mathematics is all around us.

MAA Online introduced *Found Math* in the summer of 2007 by asking people to look for math in their everyday lives, photograph it, and send in the image. We select a new image to post each week on MAA Online's homepage. We received dozens of responses.

Stunning images from Russia, Germany, Italy, Australia, Japan, China, Peru, Spain, Switzerland, England, and Papua New Guinea have given *Found Math* an international feel at times. Other striking photos, from rock formations and road signs to wedding cakes and square-wheeled bikes, remind us that math can be found in our own backyards.

If you think you have a great idea for *Found Math*, shoot it and send it to us with a brief description at *editor@maa.org*. You can browse every image that has been featured as *Found Math* at http://www.maa.org/FoundMath/FMgallery08.html, and remember to check every Monday morning to see the new *Found Math*.

Although many flowers have three, five, or eight petals (Fibonacci numbers), some have six petals (not a Fibonacci number). *Photo by Julian Fleron, Westfield State College.*

Above: Because Reuleaux triangles have a constant width, this triangular manhole cover in San Francisco would be just as unlikely as circular ones to fall through the opening. *Photo by Owen Byrne.*

Left: What better way to celebrate mathematics on Pi Day (3/14) than with a piece of the fractal vegetable, Romanesco broccoli, sitting in a bowl with pi itself rounding the edge. *Photo by Mark Leonard.*

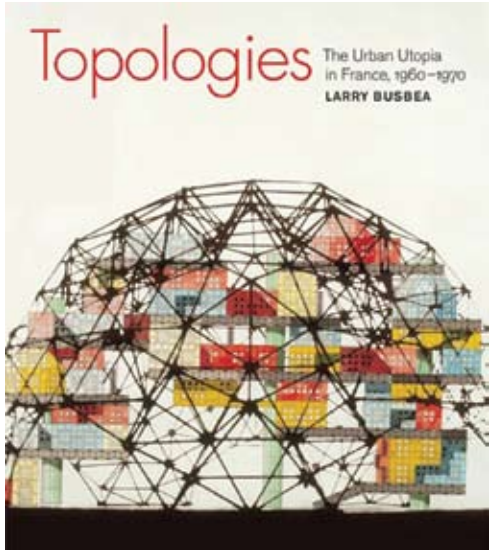
More *Found Math*

I trusted the 71,000 miles registered on the odometer. Such an engine should generate another 30,000 miles before an expensive overhaul. Most antique cars cover less than 200 miles a year so that translates into 15 years of inexpensive pleasure.

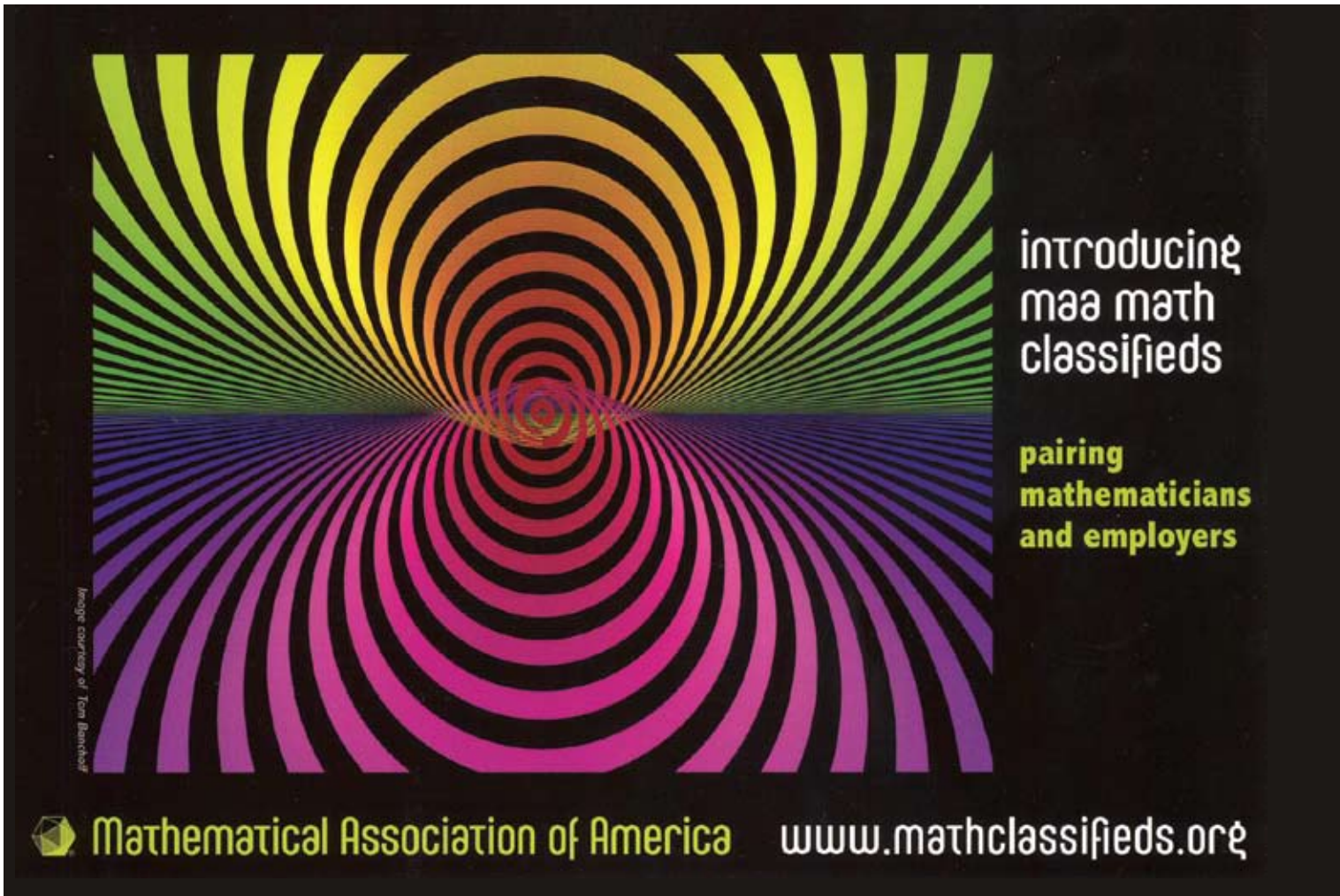
"The Home Forum,"
by Joseph Ferguson
The Christian Science Monitor,
January 24, 2003

Thanks to Robert Haas, who comments—
"Time probably moves differently for an antique car buff..."

And in contrast... Found Non-Math



Larry Busbea's book (from MIT Press) is about "The Urban Utopia in France, 1960–1980", not about topological spaces!



There and Back Again—

A Mathematician and His Family's Odyssey "Down Under"

Randall Swift

My research interests are wide and varied but have always centered upon aspects of probability theory. In recent years I have been studying stochastic modeling of biological processes, particularly mathematical epidemiology — the mathematical study of the spread of disease.

In 1985, I enrolled in a graduate course on applied stochastic processes at U.C. Santa Barbara. The professor was Joe Gani—whose beautiful lectures on applied probability were simultaneously stimulating and profound. The effects of that course still influence me today. I left Santa Barbara with an MA in mathematics, and went on to obtain my PhD in mathematics studying abstract probability at U.C. Riverside in 1992.

My interests in applications of mathematics have always directed my studies. In 1999, I wrote a small article on the effect of random catastrophes on populations. After searching through the various journals, I found that *The Mathematical Scientist* had published several articles in related areas. As fate would have it, Joe Gani is the editor of this journal.

The family on the tarmac on Christmas Island.

My submission of this article to *The Mathematical Scientist* (it appeared in the volume for 2000, pages 32–36) began a renewed friendship. Joe had retired from U.C. Santa Barbara and returned to Australia. We began to correspond. We regularly exchanged emails about life, politics, mathematics, and, especially, jokes. Over the years, our friendship grew. Although I had not seen him since 1987, it was clear Joe and I had many common interests. He was always keenly interested in hearing of my children and their accomplishments.

Late in 2004, Joe invited me to visit him at the Australian National University (ANU). Joe is a member of the Stochastic Analysis Group of the Centre for Mathematics and Applications at the ANU, which is the premier research university in Australia. It was recently rated 16th in the world ranking of universities in the Times Higher Education survey. ANU is located in Canberra, the capital of the country, and is partly patterned after the Oxford and Cambridge style of education. It has a vibrant visitors program, which provides accommodation and living stipends for visiting fellows.

My initial visit to the ANU in September 2005 began the most fruitful collaboration of my career. That initial visit laid the groundwork for Joe and me to continue to collaborate "across the Pacific." During that first year, we jointly wrote and published several papers. I returned again to the ANU during August and September of 2006 and Joe and I began to make plans for me to return for an extended visit.

Joe Gani

I was eligible for a Sabbatical leave from the California State Polytechnic University, Pomona during the 2007–08 academic year. Bronwen Whiting, one of the faculty members of the School of Finance and Applied Statistics at the ANU, was going to be on maternity leave, so it was my good fortune to be offered two courses by Professor Terry O'Neill, head of the school. In return for my lecture duties, the ANU would fly my wife, myself, and our four children to Australia, as well as provide us with living accommodations and a stipend. To be able to take my family "Down Under" to live and work for an extended period was the chance of a lifetime.

The initial part of our trip would be a holiday in Fiji. I knew that once we

The house at 8 Leversidge.

were in Australia life would resume its busy pace, even though we were in another country. After much planning, we departed the States on June 25, 2007, traveling via Fiji to Canberra. We arrived in Canberra on July 3rd and quickly discovered just how cold it is at that time of the year in Australia. It was 3° C. Having just come from Fiji and, before that, Southern California, we thought that was very cold!

We stayed at a comfortable three-bedroom house on campus. This house, at 8 Liversidge Street, is the last of the cottages that the university uses for visitors. Built in 1913, it is Heritage Listed and has been beautifully restored. What a perfect place for a family of six to live!

Once we settled into our new home in Canberra, life began its usual routine. Australians are warm and inviting, and we soon grew accustomed to life there. My oldest daughter, Kaelin, attended Campbell High School. She would have me report here that her experience there was "the best" and that "Australian teenagers are more sincere and caring than their American counterparts." She remains in contact with many of the "mates" she made there.

The ANU offered us many opportunities. Robyn, my second oldest daughter, studied flute with a world-class flutist, Lina Andonovska (19 years old), an internationally recognized performer who has just completed her honours degree in music at the ANU.

All members of the faculty, particularly Terry O'Neill and Michael Martin, made me very welcome in the School of Finance and Applied Statistics. During our stay, I gave two lecture courses at the ANU: one large section (more than 300 students) of elementary statistics and one section on marketing research methods, a tough course for a mathematician to teach to business students. Needless to say, I learned a lot.

The family flourished while we were there; we took every opportunity to travel and visit sites. As the nation's capital, Canberra always has "something on" — from museums to art galleries to concerts and plays. We were always busy locally. We visited everything the Capital had to offer, from the National Museum to the War Memorial and Bungendore, an idyllic "bush" community. We also took every chance we could to take extended trips.

The time I spent working and studying with Joe Gani was brilliant. I have learned so much from our collaborations. During our stay, Joe and I wrote and published eight papers on such diverse topics as modeling the spread of a carrier-borne epidemic, the common cold, and polymer chain reactions of enzymes. Additionally, Joe and I finished editing a volume of collected papers on applied probability for the *Journal of Statistical Theory and Practice*. Joe has been a mentor and collaborator for me and, perhaps more importantly, he has enjoyed the role of being the children's "Australian grandfather." They truly adore him and his company.

Our time in Australia ended all too quickly. We left Canberra on the January 6, 2008 and traveled home via New Zealand. We have returned from our journey, but its memory and our experiences linger on within us. I continue to collaborate with Joe.

Since the family and I returned, Joe and I have written and published several more papers. In September 2008, I made my fourth trip to the ANU to work with Joe. I feel very lucky indeed to have had this opportunity of connecting with Australia and my many Australian colleagues. I cannot wait to go back "Down Under" again.

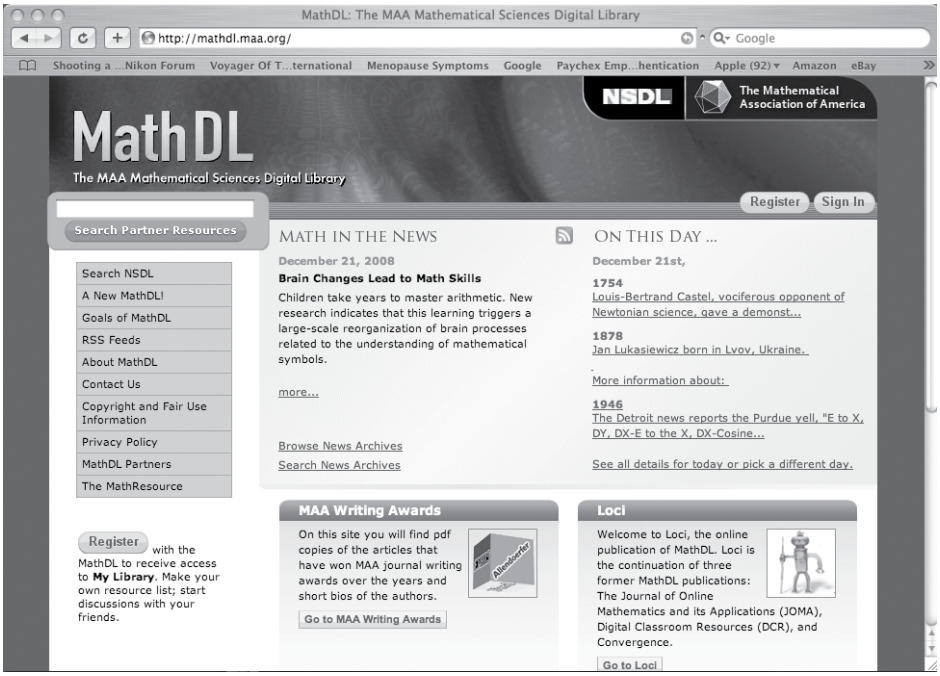
Robyn Swift and Lina Andonovska

Randall Swift is Professor of Mathematics at Cal Poly Pomona. This article was submitted to MAA FOCUS *by his colleague, Jenny Switkes, who felt that more people than just his colleagues should see it. We hope it will encourage our readers to undertake their own sabbatical adventures.*

The New MathDL

Lang Moore

On July 14, 2008 we inaugurated the new Mathematical Sciences Digital Library, combining the old MathDL and Math Gateway sites. The new site, http://mathdl.maa.org, was designed and created by Math Resources, Inc of Halifax. MathDL features a search over MathDL Partner resources, a vastly expanded MAA Writing Awards section, and a new online publication, *Loci*.



MathDL now functions as the MAA's pathway project within the National Science Digital Library (NSDL). It continues most of the old Math Gateway functions including daily *Math in the News* articles, *On This Day* (in mathematics), and the My Library features for registered users. A search over resources held by MathDL partners (formerly Math Gateway partners) remains an important feature of the new site.

With help from JSTOR and hard work by Amy Ensley, we are completing presentation of pdf copies of award-winning articles from the print publications of the MAA in the MAA Writing Awards component of MathDL. Go to the site, http://mathdl.maa.org/mathDL/22/, and check out the rotating cube logo.

We have consolidated the three online publications from the old MathDL, *The Journal of Online Mathematics and its Applications* (JOMA), *Digital Classroom Resources* (DCR), and *Convergence*, into a single new online publication, *Loci*. Tom Leathrum has been appointed as the new editor. *Loci* continues to provide access to materials presented in the three earlier MathDL publications as well as an archived copy of *Communications in Visual Mathematics*. We are seeking new materials to publish in *Loci*. See the publication's homepage, http://mathdl.maa.org/mathDL/23/, for details on submission.

MAA Reviews and *Classroom Capsules and Notes*, two components of the old MathDL are now part of *MAA Online*. They are available to all MAA members as a privilege of membership and to others by subscription.

Math Resources Inc. has become a MathDL partner, contributing entries from their mathematical dictionary, The Mathematical Resource. We will add the revived CODEE differential equations project as a partner as soon as their new web site goes online. We continue to seek new partners for MathDL.

We are actively pursuing both formative evaluation and outreach. A major component of the new evaluation effort will be a User Panel that will give us feedback on the design and content of the new MathDL. Our outreach effort centers on a plan to organize a cadre of supporters for MathDL, who will conduct MAA Section workshops, speak on their own and other campuses, and, in general, promote the project. This outreach effort was kicked off with a workshop at the MAA's Carriage House Conference Center on October 17-19, with 22 participants, including those currently involved in MathDL, representatives from the MAA WebSIGMAA and the Committee on Technology in Mathematics Education, and others with an interest in working on the project.

Lang Moore is Executive Editor of MathDL.

Writing for MAA FOCUS

Fernando Gouvêa

As the MAA's news magazine, MAA FOCUS belongs to the members of the Association. We are always looking for interesting articles by and for MAA members. Whether it's a cool bit of mathematics, an account of some recent event or accomplishment, or an article sharing a new insight about the profession, consider writing it up and sending it to us.

I often get asked about what kind of things I'm looking for. Here are some hints:

MAA FOCUS is a news magazine, not a journal. Articles for us should be interesting and informal. Don't use footnotes, and only include a bibliography if you absolutely must. If at all possible, include photos and illustrations. Keep in mind that you are writing for a wide audience of MAA members.

MAA FOCUS articles are short. With few exceptions, none of our articles runs more than two pages, which comes out to less than 2000 words. Most of our articles are actually considerably shorter, about half that size.

We like mathematics. That's why we're members of MAA. So don't be afraid to include some mathematics. On the other hand, we're not usually interested in publishing new proofs of old theorems (or, for that matter, new proofs of new theorems!). If you write about a new result, tell us the kind of thing you'd say to a colleague in the hallway to explain "what's really going on." If you write about an old result, embed it in a historical account or a personal reminiscence or something else. Think magazine, not journal.

We like pictures. If you have an interesting photo, we'd be glad to consider it for publication. If the central point is the picture, a one-paragraph caption will do instead of a full-blown article.

Remember our series. Over the years, we have started several article series. Many of them haven't had more than a couple of articles. But we're still interested. Send us a *What's the Best Textbook* article, or one about *What I Learned from…*. Tell us about the latest technological toy you're excited about. Send us a bit of Found Math (a paragraph or less, from some news source or magazine or book that deals with mathematics in some interesting way).

Consult the editor. If you're wondering whether something will work, ask me!

Don't format too much. *MAA FOCUS* has its own house style, so it's useless for you to add heavy formatting (fonts, font sizes, paragraph layout, etc.) to your article. You'll only make the editor spend time removing it. Also, avoid features (such as bulleted lists and enumerations) that don't work well in a format with narrow columns.

Some elements of house style. Here are some rules for formatting:

Almost everyone referred to in *MAA FOCUS* has a PhD and/or is a professor. So we just use full names on first mention, last names after that. No Dr. This or Prof. That.

URLs are always given with the http:// part included. We're old-fashioned that way. They are printed in 10pt Optima, and they are not underlined. Tell Word to lay off when it tries to make the URL a hyperlink.

It's "email", "web site", "online" and not "e-mail", "website" or "on line."

Em-dashes used as punctuation have no spaces before and after.

No double spaces. Ever. For any reason. Search-and-replace space-space by space.

Use email. All of *MAA FOCUS*'s production is done electronically. Feel free to use email to send me things. Email attachments are acceptable, but be careful about huge attachments, because many email servers will refuse them.

Be patient. The editor of *MAA FOCUS* wears lots of other hats. Sometimes it'll take a while for me to respond to your email, and it may take quite a while before an article appears. Please be patient. If you're worried that I forgot or lost your article, send me a note.

I'm looking forward to reading what you write!

From the Editor

Oooh, That Awful Yellow!

The yellow headers and titles in our December issue generated more complaining letters than any other feature of *MAA FOCUS* in the last several years! Let me assure everyone that Carol Baxter and I do retain our sanity. The yellow headers were not the result of some daring experimentation; rather, we both simply weren't paying attention to the interior color until it was too late. Our apologies to everyone, especially those who are colorblind or whose eyes, like mine, are no longer as given to heroic feats as they once were. We have learned our lesson!

To the Editor

We are always happy to hear from our readers. If at all possible, send letters by email to *fqgouvea@colby.edu.* Letters will be edited for publication.

How to Help Students Succeed

In the May/June *MAA FOCUS*, Carmen Latterell asked "How Do Students Study?" I would like to comment on how to help them succeed. Latterell outlines three main lessons that she has learned in years of teaching. I restate each along with techniques I have found useful.

Students do not read the textbook, but they do attend lectures. One interesting way to encourage students to read the textbook is through the use of reading questions. For each section, assign two to three definition-based or open-ended questions that students must turn in at the beginning of class. For instance, in a differential equations class teaching first-order linear DEs, you may ask: 1. What is the standard form of a first-order linear equation? 2. Are all Linear DEs separable? 3. What is the role of the integrating factor?

Students do not work problems that are viewed as extra. One way to get students to work more problems is to collect more than you grade. I reserve a small percentage of the points for completeness. This way, students feel they are rewarded for the problems that are collected, but not graded.

Students think they are doing better than they are. It is important for a student to realize where they stand in a course. If you keep an up-to-date grade book it is very easy to include a students' class total at the top of any assignment. A simple 248/300 at the top of the second test quickly lets the students know that they are currently at a low B.

Chris Frayer
University of Wisconsin–Platteville

More on Induction

In regard to the article "More on Teaching Induction" by David M. Bradley (October 2008) on the overuse of induction as a proof technique: We can certainly construct proofs of combinatorial identities, such as his example—$1 + 2 + 3 + \ldots + n = n(n + 1)/2$—that hide the induction from our students. As mathematicians, though, we should keep in mind that with identities of this type induction is always present, at least in the background. There is an implicit quantifier in front of the identity saying "for every positive integer n…" And in almost every treatment of the foundations of mathematics, the definition of the positive integers is via the recursive Peano axioms or some equivalent recursive method. Induction is often the most natural proof technique when dealing with recursively defined structures.

I have always taught my students that an ellipsis is almost certainly a shorthand notation, a flag shouting "induction is the proper tool to make this concept formal." The left-hand side of the identity above is nonsense when n is 1, 2, or 3, and ambiguous for larger integers. A better, unambiguous expression, valid for every positive integer n, is $\sum_{i=1}^{n} i$, where the $\sum$ notation is defined recursively:

$$\sum_{i=1}^{1} a_i = a_1, \text{and } \sum_{i=1}^{n+1} a_i = \sum_{i=1}^{n} a_i + a_{n+1}.$$

In fact this recursive definition, or something very similar to it, is pretty much forced upon us by the recursive definition of the positive integers and the fact that addition is defined as a binary operation. We should not be surprised, then, when induction turns out to be a natural proof technique for identities that sum over the positive integers.

I am a great fan of the book *Proofs that Really Count*, by Arthur Benjamin and Jennifer Quinn (MAA, 2003). The first chapter, on identities involving sums of Fibonacci numbers, is typical. Some 31 such identities are proved, in a charming and apparently non-

inductive manner, by showing that both sides of a Fibonacci identity count the same set of tiling patterns. But the proofs of all these identities are based on Combinatorial Theorem 1, initially linking Fibonacci numbers to tiling patterns. And the proof of Combinatorial Theorem 1 is inductive. How else can you lay the foundation for proofs involving an integer sequence defined recursively?

There may be times when it is pedagogically advantageous to encourage our students to accept and create non-inductive proofs of combinatorial identities. But let's be aware of the fact that there is something intrinsically recursive about these identities. In such cases, an inductive proof might well be the most natural.

Paul K. Stockmeyer
The College of William and Mary

Have You Moved?

The MAA makes it easy to change your address. Please inform the MAA Service Center about your change of address by using the electronic combined membership list at MAA Online http://www.maa.org or call: 800.331.1622, fax: 301.206.9789, email: maaservice@maa.org, or mail to the MAA, PO Box 90973, Washington, DC 20090.

Weill Cornell Medical College in Qatar

Mathematics

MATHEMATICS

FACULTY POSITION

In a pioneering international initiative, the Weill Cornell Medical College (WCMC) established the Weill Cornell Medical College in Qatar (WCMC-Q) with the sponsorship of the Qatar Foundation for Education, Science and Community Development. WCMC-Q is located in Doha, Qatar, and in its seventh year of operation, its inaugural class having graduated with Cornell MD degrees in May 2008.

WCMC-Q seeks candidates for a full-time senior level faculty position to teach in Doha in the Pre-medical Program, with major responsibility for teaching mathematics to premedical students. The two-year Pre-medical Program is designed to prepare students for admission to the WCMC-Q Medical Program. Intensive and challenging, this two-year program has been specifically prepared for students in the Middle East. It provides them with instruction in subjects that comprise the pre-medical requirements of most medical colleges in the US.

The successful candidate will teach one course per semester at the level of college calculus and introductory statistics. In addition, he/she will participate in student academic advising, committee work, and the academic life of WCMC-Q. Research funding support is available and active participation in relevant research will be encouraged.

Qualifications include a Ph.D. in Mathematics, demonstrable teaching skills, and teaching experience at the college/university level. Candidates are expected to have experience in the American higher education system and must be willing to relocate to Doha, Qatar for the duration of the appointment. Academic rank and salary are commensurate with training and experience and are accompanied by an attractive foreign-service benefits package. Qualified applicants should submit a curriculum vitae and a letter of interest outlining their teaching and research experience to:

http://job.qatar-med.cornell.edu *

***Please select the appropriate position under the Academic options and indicate job # 08-wcmcq-MT**

Cornell University is an equal opportunity, affirmative action educator and employer. Details regarding the WCMC-Q program and facilities can be accessed at: **www.qatar-med.cornell.edu**

The screening of applications will begin immediately and continue until suitable candidates are identified. Please note that due to the high volume of applications, only short-listed candidates will be contacted. Service is expected to begin in August 2009.

Short-listed candidates will be asked to provide names of three references.

COLORADO

University of Denver

The Boettcher Teachers Program has paid urban teaching fellowships that
provide:

- a master's degree in Curriculum & Instruction from the University of
  Denver Morgridge College of Education
- a Colorado teaching license
- a structured opportunity to change careers
- high-caliber, hands-on, teacher education in and for urban schools in Adams 12 & Mapleton school districts

Seeking applicants in bilingual elementary, elementary education, math, science, & Spanish

Application deadline Feb. 1, 2009

Questions? Email ***dbarton@pebc.org*** or call 303-861-8661

Eligibility Information

Applicants must:

- Have earned a Bachelor's degree from an accredited institution by start of program (July 2009)
- Be able to work legally in the U.S.
- Have proficiency in English at the graduate school level
- Be academically qualified (by July 2009) in the licensure area sought, based upon the Colorado Department of Education subjectarea requirements for Alternative Teacher Licensure (visit ***www.cde.state.co.us*** for more information)
- Pass the teacher content knowledge exam (either the PLACE or Praxis II) for the discipline they wish to teach
- Take either the GRE or MAT and TOEFL (for international applicants only) for admission into the University of Denver.

NORTH CAROLINA

Wake Forest University

Applications are invited for two tenure track positions in mathematics at the assistant professor level beginning August 2009.

We seek highly qualified candidates who have a commitment to excellence in both teaching and research. A Ph.D. in mathematics or a related area is required. Candidates with research interests in Number Theory, Combinatorics, or Algebra will receive first consideration. The department has 20 members and offers both a B.A. and a B.S. in mathematics, with an optional concentration in statistics, and a B.S. in each of mathematical business and mathematical economics. The department has a graduate program offering an M.A. in mathematics. A complete application will include a letter of application, curriculum vitae, teaching statement, research statement, graduate transcripts and three letters of recommendation. Applicants are encouraged to post materials electronically at *http://www.mathjobs.org*. Hard copy can be sent to Stephen Robinson, Wake Forest University, Department of Mathematics, P.O. Box 7388, Winston-Salem, NC 27109. (*sbr@wfu.edu, http://www.math.wfu.edu*) AA/EO employer.

OHIO

Ohio Wesleyan University

Department of Mathematics and Computer Science

Applications are invited for a tenure-track assistant professor position in mathematics to begin in August 2009.

A Ph.D. in mathematics is required with a strong preference for specialization in discrete mathematics or algebra. We seek a new staff member wishing to teach a broad range of undergraduate mathematics courses and to work closely with undergraduates in and out of the classroom. Also important is interest in directing student research projects and developing new courses and activities to enhance the mathematics program. Professional activity and departmental service are expected. The teaching load is three courses each semester. Ohio Wesleyan University is a selective, undergraduate-only liberal arts and sciences institution of 1850 students located in Delaware, OH, a community of 21,000 located 20 miles north of Columbus, OH (the state capital, having a population of over 1,000,000). Please send a letter of application, a statement of teaching and research interests, CV, transcripts (both graduate and undergraduate), and three letters of recommendation to: Professor Jeffrey Nunemacher, Department of Mathematics and Computer Science, Ohio Wesleyan University, 61 S. Sandusky Street, Delaware, OH 43015.

To ensure full consideration, applications should be received by January 26, 2009. Further information can be found at *http://math.owu.edu.* The university is strongly committed to diversity and encourages all interested parties, including women and minorities, to apply.

PENNSYLVANIA

University of Pittsburgh at Bradford

Mathematics (Assistant Professor, tenure-stream), beginning Fall 2009.

Requirements: Ph.D. or Ed.D. in Math by December 2009. A strong commitment to undergraduate education on a small rural campus and potential for scholarly work are essential. Applicants with math education background or a willingness to develop this expertise will be given favorable consideration. Teaching assignment will include general education math courses, probability and statistics. Send letter, vita, unofficial transcripts, and 3 letters of reference to: Dr. Marius Buliga, Math Search Committee, University of Pittsburgh at Bradford, 300 Campus Drive, Bradford, PA 16701. *www.upb.pitt.edu/acadsearch.aspx* Review of completed applications will begin January 15, 2009, and continue until position is filled. Pitt-Bradford is a beautiful, friendly campus with an emphasis on teaching. While faculty have the advantage of the expansive resources and research opportunities available through the University of Pittsburgh system, they also enjoy one-on-one contact with their students in a secure, personalized environment. Individuals representing all aspects of diversity are encouraged to apply. AA/EOE.

WEST VIRGINIA

Shepherd University

Assistant Professor of Applied Mathematics, Shepherd University.

Tenure-track, 9-month faculty position, to begin August 2009. Teach courses in mathematics, engineering and/or related fields in computer engineering. Requirements: Ph.D. in applied mathematics or closely related field in electrical engineering or computer engineering required by the date of appointment. Looking for an energetic individual who can interact closely with students, engage in undergraduate research, participate in community activities such as mathematics contests, and inspire students. Teaching experience at the university level is desirable. To apply for full consideration and other details regarding this position; please refer to *https://jobs.shepherd.edu.* Applications are accepted until the position is filled. EOE.

WISCONSIN

Ripon College

Ripon College invites applications for a tenure-track position in the Department of Mathematics and Computer Science to begin August 2009.

The successful candidate will demonstrate excellence in undergraduate teaching, scholarship, and an appreciation for the role of faculty service in the life of the institution. Qualified candidates from all fields of the mathematical and computer sciences will be considered, although the ability to teach mathematics courses is required. Ripon College is a Phi Beta Kappa liberal arts college with a history of commitment to excellence in undergraduate education. Interested candidates should submit a letter of application addressing qualifications, CV, three letters of recommendation, evidence of teaching effectiveness, and a statement of teaching philosophy to David Scott, Chair, Department of Mathematics and Computer Science, Ripon College, P.O. Box 248, Ripon, WI 54971. Reviews of applications will begin December 1, 2008 and will continue until the position is filled. AA/EOE.

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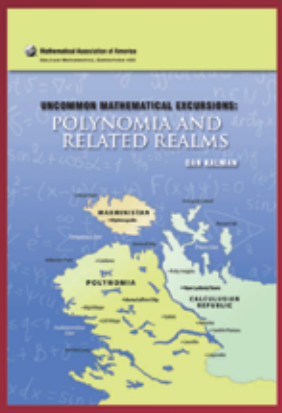

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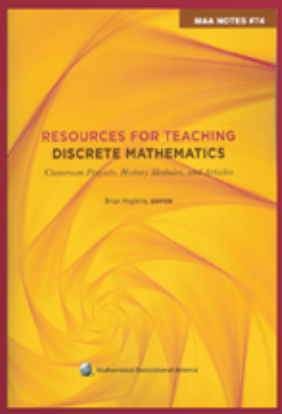

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Resources for Teaching Discrete Mathematics
Brian Hopkins, Editor

Resources for Teaching Discrete Mathematics presents nineteen classroom tested projects complete with student handouts, solutions, and notes to the instructor. Topics range from a first day activity that motivates proofs to applications of discrete mathematics to chemistry, biology, and data storage. Other projects provide supplementary material on classic topics such as the towers of Hanoi and the Josephus problem, how to use a calculator to explore various course topics, how to employ Cuisenaire rods to examine the Fibonacci numbers and other sequences, and how you can use plastic pipes to create a geodesic dome.

Five articles complete the book. Three address topics on an exploration of historical counting problems with attention to discovering formulas, a discussion of how computers store graphs, and a survey connecting the principle of inclusion-exclusion to Möbius inversion. Finally, there are two articles on pedagogy specifically related to discrete mathematics courses.

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