MAA FOCUS

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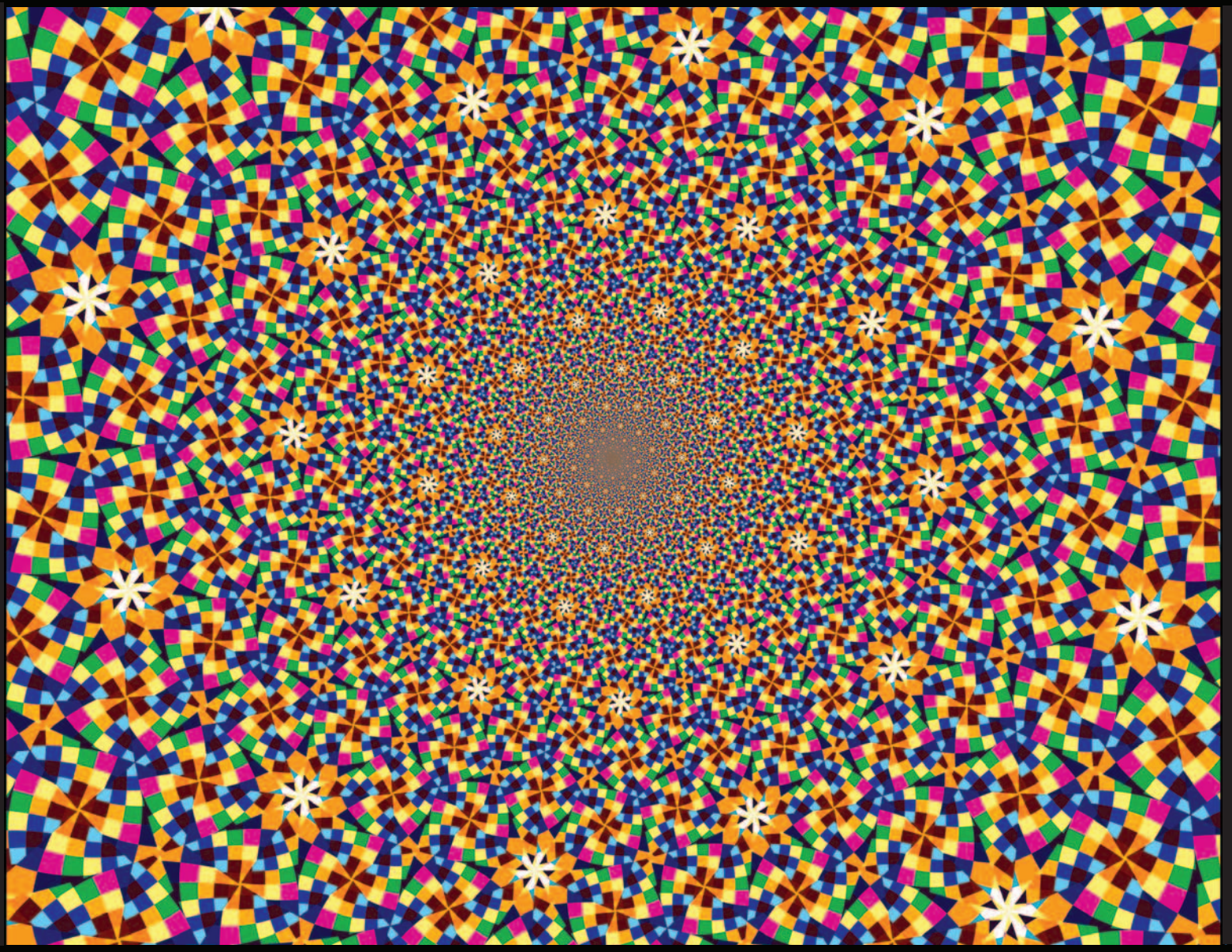

WHAT'S INSIDE

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MAA FOCUS

Volume 28 Issue 9

Inside

On the cover: "The Dome," by Mehrdad Garousi. See the description of this image see page 13. Used by the permission of the artist.

AAAS Meeting in Chicago Features Mathematics and Applications

By Edward Aboufadel, Secretary of Section A of the AAAS

The 2009 Annual Meeting of the American Association for the Advancement of Science will be held on February 12–16, in Chicago, IL. The theme of this year's meeting is "Our Planet and Its Life: Origins and Futures," which is a nod to the fact that 2009 is the 200th anniversary of the birth of Charles Darwin and the 150th anniversary of the publication of *On the Origin of Species by Means of Natural Selection*. Many of the symposia sponsored by Section A (Mathematics) are interdisciplinary sessions that fit this theme.

The Annual Meeting is organized into symposia which have three or more speakers, and often a discussant who reflects on the talks that are given. Section A is sponsoring six symposia this year, featuring outstanding expository talks by prominent mathematicians. The six symposia sponsored by Section A this year are:

The Mathematical Twists and Turns of Data Sets
(organized by Robert Ghrist, University of Illinois, Urbana-Champaign)

Games People Play: Challenges of Applying Mathematics and Computers to Games
(organized by Bob Hearn, Dartmouth College)

Climate and Disease: Quantitative Insights and Interdisciplinary Challenges
(organized by Mercedes Pasqual, University of Michigan)

Green, Gene, Growing Machines: The Evolutionary Shaping of Plant Form
(organized by David Baum, University of Wisconsin)

Mathematical Biology, the New Frontier: Educating the Next Generation
(organized by Bonnie Shulman, Bates College)

Mathematics of Origami: From the Joys of Recreation to the Frontiers of Research
(organized by Edward Aboufadel, Grand Valley State and Patsy Wang-Iverson, The Gabriella and Paul Rosenbaum Foundation)

Other symposia that will be of interest to the mathematical community include:

- New Computing Platforms for Data-Intensive Science
- A New Kind of Scientist: Professional Master's Education and U.S. Competitiveness
- Artificial Cells: Models of the Simplest Life
- The Grid, the Cloud, Sensor Nets, and the Future of Computing
- Big, Small, and Everything in Between: Simulating Our World Using Scientific Computing
- Providing Science Advice to the U.S. Congress: Is a New Paradigm Needed?
- The Evolution of Knowledge Production: Exploring Creativity, Innovation, and Networks
- Earth's History and Future Revealed at the Frontier of Scientific Computing
- K-12 Engineering Education in the United States
- Inquiry or Direct? Research-Based Practices in Science Education
- Interdisciplinary Approaches to the Study of Large-Scale Human Networks
- The Science of Kissing

The above symposia are only a few of the nearly 200 AAAS program offerings in the physical, life, social, and biological sciences. For further information, including the schedule of talks, go to http://www.aaas.org/meetings.

AAAS annual meetings are the showcases of American science, and they encourage participation by mathematicians and mathematics educators. Section A acknowledges the generous contributions of AMS and MAA for travel support and SIAM for support of media awareness. The AAAS Program Committee is genuinely interested in offering symposia on pure and applied mathematical topics of current interest, and in previous years there have been symposia on subjects such as mathematics and the brain, quantum information theory, the changing nature of mathematical proof, and the mathematical analysis of the performance of baseball players.

The 2010 meeting will be February 18-22, 2010 in San Diego. The Steering Committee for Section A seeks organizers and speakers who can present substantial new material in an accessible manner to a large scientific audience. All are invited to attend the Section A Committee business meeting in Chicago on Friday, February 13, 2009, at 7:45 PM, where we will brainstorm ideas for symposia. In addition, I invite you to send me, and encourage your colleagues to send me, proposals for future AAAS annual meetings. I can be reached at aboufade@gvsu.edu.

Steering Committee for Section A February 2008 to February 2009:

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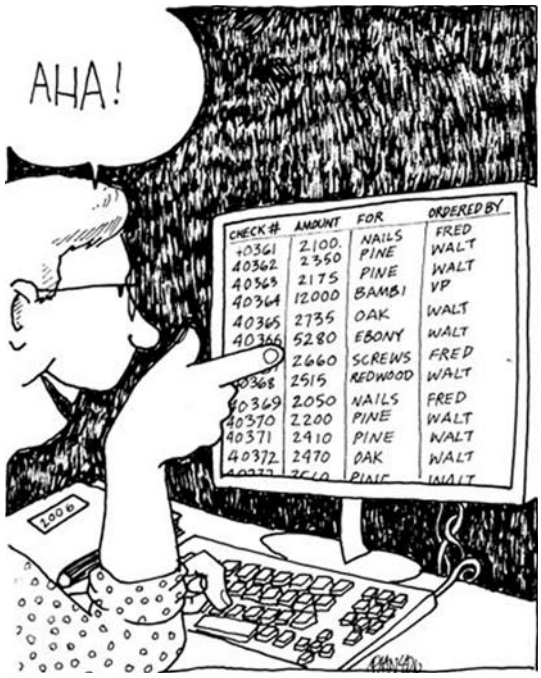
Mathematics and Accounting: A Non-Empty Intersection

By Rick Cleary and Jay Thibodeau

Most people see mathematics and accounting as closely related subjects: both are quantitative fields that involve problem solving, and a student with an exposure to only entry level topics in each area would very reasonably conclude that they have a great deal in common. A high school algebra course and a first bookkeeping course, for example, each involve learning some algorithms that, when correctly applied, lead to a specific result that is the unarguably correct answer; one that can in fact be checked in the back of the book.

When confronted with evidence of this perception, for example when a new acquaintance says, 'Oh, you're in math? My sister-in-law is great at math, she's an accountant,' many mathematicians cringe. They look for some way to explain that we work in a field that requires great creativity and insight, as opposed to just bookkeeping. In a similar way, professional accountants praised for being 'good with numbers' are quick to point out that there is much more to their work than just number crunching. They are often proud of their quantitative abilities, but they view their work as much broader, involving settling difficult real-world questions, sophisticated decision making, and communication skills.

It has not always been the case that the leading academics in mathematics and accounting were so eager to enforce that distinction. Indeed many great mathematical discoveries have come about as the result of attempts to solve problems in business and commerce. For an excellent example, see Keith Devlin's recent column on 'The Big Mortgage Surprise' at MAA Online. Looking a little bit further back into history, Devlin and other historians also see the development of modern double-entry accounting as a creative quantitative innovation that allowed for trade and other types of commerce to dramatically expand during the Renaissance. Over time, these types of innovation led to the creation of associated applied mathematical problems in risk management, interest theory, and modern actuarial science.



Cartoon by John Johnson

In a variety of teaching and research collaborations over the last six years, we have come to gain significant insight into each other's fields, with tangible benefits in both our classrooms and our scholarly work. We believe that mathematicians and accountants should not be so quick to reject the conventional wisdom that they actually have a great deal in common. In this article, we present some of the ways in which the work of both groups are surprisingly similar and we suggest that there may be other topics that could lead to fruitful collaboration among our colleagues. The examples we mention are, of course, influenced by our specialties within our respective fields (i.e., Rick is a statistician, and Jay is an auditor). However we do believe that the general principles apply much more broadly even if we can not immediately produce a problem that, for example, seems ripe for joint work between a topologist and an expert on international taxation.

Patterns, Deviations and Separating Examples

Mathematicians see themselves as experts in pattern recognition. When a mathematician discovers a new object, it is of course compared to known cases, and then deviations from the known forms are studied most carefully. Indeed, deviations lead to new classifications, and a search for generalization leads to decision rules about how to classify objects. Separating examples become a stock in trade, one that we expect students to learn even in first year courses in calculus. ("Can you give an example of a continuous function that is not differentiable?")

Similarly, external auditors looking at the financial statements of a company or institution have many details to consider, but at the core, they face what is very simply a binary-choice problem: Either the financial statements are free of material misstatement, or they are not. And, if they are not, they require that some type of adjustment be made. At the beginning of every financial statement audit, auditors will rely on their prior experience and the patterns that are available in the data under consideration, and seek to identify the deviations that do not fit the pattern of a healthy company to help make the classification. The end result of these processes may differ (a proof for mathematicians, a decision and a public statement from the auditor) but there are similarities in process that are well worth considering.

Because of the 'high stakes' involved in auditing publicly traded companies, the cognitive processes of auditors have been carefully studied by accountants for some time. In fact, there is a substantial body of research that has studied differences in cognitive processes exhibited by auditors and then linked those differences to various measures of audit judgment performance. For example, Bedard and Biggs (1991) found that auditors that were able

to recognize basic underlying patterns in a set of data were able to perform significantly better in generating and evaluating a hypothesis about a seeded error in the data. One of the important conclusions of this and related audit judgment research is that pattern recognition is important for auditors.

Beyond the importance of pattern recognition, what other similarities exist between the cognitive processes of expert auditors and expert mathematicians? Moreover, what are the other opportunities for collaboration that exist for accountants and mathematicians?

Example: Sampling and Fraud Detection

The authors of this article have worked together at one important intersection of auditing and mathematics, the use of Benford's law as a tool to detect fraud. Benford's law refers to a probability distribution that is startlingly accurate at representing the first significant digits of the entries in many real world data sets. The Benford distribution is very different from the uniform distribution that many people naively expect first digits will follow. In fact if we say d is the first significant digit, Benford's law says that the probability that d is equal to i is

$$P(d = i) = \log_{10}((i + 1)/i)$$

for values of i in the set {1, 2, 3, … , 9}. Note that this implies that entries beginning with 1 are roughly seven times as likely as entries beginning with 9… you can do the calculation to check!

How can this rather surprising result be of use to auditors? For a collection of values to follow Benford's law, one basic requirement is that the values span several orders of magnitude. Think, for example, of collecting the resting pulse rates (measured in beats per minute) from a large set of individuals. Would Benford's law apply? Certainly not, resting pulses usually vary from around 60 to 80, and a first digit of '2' is nearly impossible! But what if the values are the collection of recent accounts payable for a business? Then the restriction of many orders of magnitude is almost certainly met, as business make purchases both large and small over a wide range of dollar amounts. Thus many auditing software packages contain options to test if the first digits in a particular set follow Benford's law. If they do not, fraud is one of several possible explanations that the auditor must explore. Accountant Mark Nigrini deserves much of the credit for bringing this connection to the attention of the audit community; see Nigrini and Mittermaier (1997) for details.

This auditing example follows the cognitive framework familiar to both mathematicians and auditors. We have a new object, in this case a firm's financial records. Does this object conform to the expected pattern, in this case Benford's law? And if not, how do we classify the difference? Is it due to fraud, or is there an innocent explanation? It is also worth noting Benford's paper proposing this distribution appeared in 1938, and it was nearly 60 years later that Nigrini and others in the field of accounting began to take advantage of the result. It is one of many wonderful examples of how a 'pure' research idea can prove to be an important 'applied' idea some time later.

While there are some caveats in the application of Benford's law to auditing (see for example Cleary and Thibodeau 2005), the concept is a powerful one that applies in many fields beyond business. A nice example is to sample addresses from residents in a local phone book and look at the first digits, which tend to agree quite well with the Benford distribution. Or consider recent allegations of voter registration fraud. Voters have addresses, and one quick check of the validity of any list of voters would be to see if the first digits of the addresses conform to Benford's law.

This application also follows the cognitive process of looking for deviations from an expected pattern, just the process that we claim that mathematicians and auditors (and no doubt people in many other fields) share. We believe that there are many other potential applications that bridge our two fields. In fact, at the moment we are working on a project to recast the model that auditors use to assess risk into more standard statistical notation so that external auditors can carefully consider the notions of 'Type I error,' 'Type II error,' and 'power' in the financial statement audit setting.

As is often the case, when two fields have grown apart there are many ways in which we can use joint research to educate each other and provide great value to both fields. We therefore urge our colleagues to seek each other out and learn about other areas of common ground to work together, or at the very least to be a little less dismissive of each other.

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Rick Cleary is Professor and Chair of the Department of Mathematical Sciences at Bentley University, visiting the Harvard University Statistics Department for 2008-09. He is a member of the Executive Committee of the Mathematical Association of America, serving as chair of the Budget and Audit Committees.

Jay Thibodeau is Associate Professor in the Department of Accountancy at Bentley University. He is a member of the Executive Committee of the Auditing Section of the American Accounting Association, serving as the Secretary and the Past Chair of the Auditing Education Committee.

Teaching Time Savers: Working for a Week

By Bill Fenton

When I started as a teacher, my overwhelming question was "what am I going to do in class tomorrow?" That question showed my mindset, thinking just one day ahead. What are the upcoming topics; how do they relate to the previous topics; how can I make all of this clear to the students? There was always a deadline looming just ahead of me. This was a nerve-wracking way to live!

When I sat down to prepare for a class, I typically used the following steps:

1. Read the appropriate section of the text.
2. Outline the major concepts from that section.
3. Create illuminating examples that were different from the examples in the text.
4. Write the presentation, based on the outline and my examples.

This preparation could take as little as 30 minutes for a precalculus class, or as much as 90 minutes for abstract algebra or some other upper-level course. The time varied considerably, of course, depending on the topic of the day. Linear equations take a lot less prep time than linear transformations!

Since my institution has a teaching mission, I typically taught three or four courses per semester. It usually has been three courses per semester since I became department chair, but often this is three different courses. Preparation time was consuming a large part of my life.

In the early 1990s, thanks to an intensive calculus reform workshop, I became a user and proponent of cooperative learning. This has affected every aspect of my teaching, especially the class preparation. I still begin to prepare for class by reading the section and outlining the major concepts, and I still write the presentation at the end. However, step 3 has split into two parts:

3a. Decide how best to involve the student groups.

3b. Create group activities, mostly based on illuminating examples.

The extra thought about how to get groups involved added about 15 minutes to each class' preparation time, though this decreased as I gained experience and expanded my repertoire of cooperative learning techniques. In total, a typical 50-minute class was taking about an hour to prepare — and this happened three times a week for every course.

At some point about a decade ago I decided to plan over a longer period than just tomorrow's class. Now I prepare for an entire week's classes of a course at one sitting. This has some real advantages over the day-by-day approach. First of all, I have to assemble the necessary materials (text, references, calculator, software, etc.) only once a week.

Secondly, the start-up time of getting my mind focused on the particular subject happens only once. I teach lots of different courses at different levels, from elementary statistics to discrete math to advanced geometry to… It sometimes takes me a few minutes to adjust my frame of reference.

A real plus is that I always have more material ready to present in class, so I never lose time at the end of a class period. I also believe that preparing for a week at a time leads to greater connectedness from one class period to the next. It has become very natural for me to design presentations that introduce a concept in one class and extend it in the next class.

In Discrete Math, for instance, we define the concept of combination and develop the counting formula early in the week, then do some sample calculations and explore basic properties (such as Pascal's Identity) later in the week. This gives students time to digest the basic notion before working with its ramifications. In Operations Research, we spend one class drawing a project network and finding the critical path, then at the next class we return to the same project and do the PERT analysis. Presented in this way, the content of one class relates more clearly to the content of the previous and succeeding classes.

For cooperative learning purposes, planning for an entire week helps me incorporate a greater variety of in-class activities for the groups, which helps to keep the students engaged with the presentations.

A week's preparation takes me about two hours per course (again with much variation by course). It is necessary to find a block of time to do this, but the designated time is focused and productive — it is time well spent. I always have a real feeling of accomplishment when an entire week's classes are ready. Furthermore, the pressure of a deadline is gone for a while!

Time Spent: about two hours per course preparation each week. This varies by course and by topic, but the total time is always less than that for several separate preparation sessions.

Time Saved: about an hour per week per course.

Bill Fenton is Chair of the Mathematics Department at Bellarmine University in Louisville, KY. He can be reached at wfenton@bellarmine.edu.

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

MAA National Elections 2009 Go Green
A Letter to MAA Members

Dear Members,

The MAA National Elections will be held in April and May 2009 in accordance with Article IV, Sections 1(a) and 2 of the Bylaws of the Association. You will be asked to vote for candidates for national officer positions who will assume their respective offices in January 2010. These positions are President-Elect for a term of one year (who will become President in 2011 for a term of two years), First Vice-President for a term of two years and Second Vice-President for a term of two years.

This is your opportunity to influence the future of the MAA. It is important for these decisions to be made by us, the members. This year we have made some slight adjustments to the voting procedures in order to make it easier for our members to vote as well as to make our elections more environmentally friendly by reducing our use of paper ballots. I encourage you to read the detailed information below and I invite everyone to vote.

Martha Siegel,
Secretary

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?

The MAA has your correct email address on file, if you receive the monthly e-newsletter *MathAlert*. This e-newsletter is usually sent to members in the middle of each month. If you do not receive *MathAlert*, 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:

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

   MAA National Elections 2009
   1529 18th Street NW
   Washington, D.C. 20036
3. **Fax:** Fax your request to (202) 387-5948. Be sure to include your name and address.
4. **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, D.C. 20036

Go Green!

In order to save time, money, and the environment, we encourage all members to use their email address for this important process. Thank you!

What Happens After You Make It to the Tenure Track?

By Robert W. Vallin

Congratulations! You've made it to the tenure track. Soon you will be settled into your new office, placed all your books and journals up on the shelves, and written syllabi and lesson plans. You're also preparing your thesis for publication, and starting on new projects. No worries.

Except…

What can I do to learn to teach a subject I've never studied?

How do I balance work and family?

What's the technique for writing a grant proposal?

How can I get more deeply involved in this new research topic not related to my thesis?

Where are the resources I need?

Starting up your career on the tenure track can be a real challenge. Perhaps it's due to the increase in the number of classes you teach, or adjusting to being a faculty member and not a student, or the juggling act of teaching, research, and service. In case you run into problems, or better yet to head them off before they become a problem, we will look at some of the resources available for new faculty.

No discussion for newly minted faculty is complete without mentioning Project NExT (New Experiences in Teaching). This is an MAA program for new or recent PhDs in the mathematical sciences. Despite the acronym, it is not exclusively about teaching, NExT helps in all areas of a career.

Participants are matched up with mentors, and workshops cover very diverse topics such as "Alternate Methods of Assessing Student Achievement," "Writing Grant Proposals," and "Involving Undergraduates in Mathematical Research." Slots in Project NExT are awarded on a competitive basis. About 70 new NExT Fellows are admitted per year. For more information, visit their web site at: http://archives.math.utk.edu/projnext/.

For those who are not involved in the national NExT Program, many sections run their own Section NExT. Faculty members who are within four years of graduation and in their first four years on the tenure track may join a Section NExT. Section NExTers have workshops and panel discussions along with meeting as a group during the academic year. Joining Section NExT also facilitates meeting others in your geographical area and opening up your personal network.

Women can also find mentoring through the Association for Women in Mathematics. Information on the AWM Mentoring Network can be found through their web site at http://www.awm-math.org/.

Completing your dissertation and finding your new job was a major component of how you spent your last days in graduate school. It takes a lot of time, energy, and focus to finish. Now there's some mathematical freedom. Perhaps you wish you knew more about bringing java into the classroom, or maybe you'd like to learn some fascinating new ways to look at combinatorics. Both of these ideas you can do on your own. After all, that's one of the implications of earning your doctorate: you have the ability to research and learn on your own.

But you don't have to. Both the MAA and the AMS run courses at the Joint Mathematics Meetings (JMM), which provide intense but enjoyable forays into new topics. For example, this past January in San Diego the MAA ran 16 minicourses on topics such as "Teaching a Galois Theory Course for Undergraduates," "Mathematics and the Geometry of Voting," "Developing Department Self-Studies," and "The Fibonacci and Catalan Numbers." Also at the meeting was a two-day AMS short course entitled "Applications of Knot Theory."

Other organizations have courses, too. You will find many classes, workshops, et cetera at the Mathematical Sciences Research Institute (see their web site at http://www.msri.org), as well as several summer workshops to participate in through the Center for Discrete Math and Theoretical Computer Science (see http://dimacs.rutgers.edu). The Institute for Advanced Studies runs the Park City Mathematical Institute, which has an annual summer program for mathematicians of all kinds; (see http://pcmi.ias.org).

What if there is no minicourse that you wish to take? There are still ways to get career help and advice at meetings like the JMM. Welcome to the world of panel discussions. Panels are great because you will hear different points of view from people eager to share their experiences. It is also nice to realize that you are not the only person with your questions.

Going back to the program for the 2008 JMM we find "How to Interview for a Job in the Mathematical Sciences," "Exciting, Surprising, and Satisfying: Why and How to Teach Proof," and "Tenure (and Promotion) – You Know You Want It." This last panel was co-sponsored by Project NExT and the Young Mathematician's Network. The YMN was founded in 1993 and refers to itself as a "loose organization of mathematicians in the junior part of their careers." Their web site is extensive and covers too many topics for us to delve into here. Their *Concerns of Young Mathematicians* page is http://concerns.youngmath.net/.

Courses and panels are also available at section meetings. In Spring 2008 the Texas Section Meeting offered a minicourse on "Integrating Biological Applications in the Mathematics Curriculum," while the Pacific Northwest Section offered two courses, "Women and Minorities in Mathematics" and "Active Learning Through Classroom Voting and Clickers." The 2007 Allegheny Mountain Section meeting had a panel discussion on "Atypical Careers in Mathematics."

Available outside of the larger meetings are the Professional Enhancement Programs (PREP) of the MAA. These are a series of non-interrelated workshops for the professional development of faculty in the mathematical sciences. They are held in many locations throughout the country during the summer.

Just a few of the Summer 2008 workshops include "Flash in the Valley: Creating Mathlets with Adobe Flash" (Shippensburg University of PA), "Expository Writing to Communicate Mathematics" (MAA Headquarters, Washington, DC), and "Inquiry-Based Learning with a Focus on Number Theory" (University of Texas, Austin). Two PREP workshops will be taught online this summer ("Calculus, Online and Interactive" and "Geometry and Art"). For more information about these workshops, go to http://www.maa.org/PREP.

Of course, when you find a topic that excites you, you wish to share your enthusiasm with others who feel that way. In school that was easy because there were other students taking those subjects. Nowadays you can still become part of the community in Math and Biology, or History of Math, or Statistics Education, or more by joining a SIGMAA. Yes, that's spelled correctly; it stands for Special Interest Groups of the MAA. The web site for the SIGMAAs is http://www.maa.org/SIGMAA/.

Currently there are 11 different SIGMAAs. More than a listserv or web site, some SIGMAAs have events during the JMM or produce a newsletter where research and teaching topics can be discussed. Remember, if you do not see a SIGMAA that intrigues you, get together with like-minded people and begin one of your own.

The first few years of a career on the tenure track can be an amazing time. While getting acclimated to your new location, you have the opportunity to look at everything mathematically available and decide what you want to become.

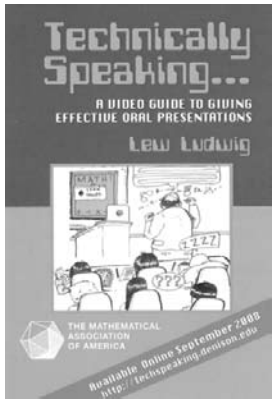
Whether you stay with your thesis topic or branch out into something new, whether you want to focus on courses for majors or focus on pre-service teachers, whether you wish to become a member of the nationally known mathematics community or help make your section of the world as great as possible, there are programs, workshops, panels, web sites, and more to help you. Take advantage of everything out there. You'll be glad you did.

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

Technically Speaking

Public speaking is a common fear. Even people who are confident about what they are saying (e.g., knowing that they have a proof), may be nervous about where they are saying it (at a meeting). Joe Gallian has written two articles for *Math Horizons* on giving a good presentation. His tips can be read in one of the MAA brochures (which can be found on the MAA's student webpage http://www.maa.org/students/).

Now these tips can been seen in action! Lew Ludwig, of the Department of Mathematics and Computer Science at Denison University, has put together a DVD entitled *Technically Speaking… A Video Guide to Giving Effective Oral Presentations*. Using a series of video vignettes, he shows students (and anyone else) the common pitfalls of an oral presentation and how to avoid them. Best of all, thanks to a generous grant from the NSF, these videos are available for free from the



MAA on a first come, first served basis. Just visit: http://www.maa.org/Surveys/TakeSurvey.aspx?SurveyID=n2LL879, fill in the request form, and a copy will be sent to you. That's all there is to it. Now is a great time to take advantage of this, with students preparing to go to the Joint Mathematics Meetings in January and/or spring Section Meetings to give talks.

Currents on Teaching and Learning links to *Teaching Time Savers*

Currents in Teaching and Learning is the new peer-reviewed online publication of the Center for Teaching and Learning at Worcester State College. *Currents* Volume 1, Number 1 (Fall 2008) has now been posted at http://www.worcester.edu/Currents/. The first issue includes a "Clips and Links" section with pointers to online resources on teaching and learning. The first one listed is the online archive of our *Teaching Time Savers* series which can, of course, be found on the MAA web site at http://www.maa.org/features/TeachingTimeSavers.html.

ICME–11: Mexico, Mathematics, and Mariachis

By Annie Selden

The 11th quadrennial International Congress on Mathematical Education, was held in Monterrey, Mexico, July 6 –13, 2008, on the campus of the Universidad Autónoma de Nuevo León (UANL). There were 2133 participants from 89 countries. I personally met participants from South Africa, New Zealand, Australia, England, France, Norway, Greece, Italy, Israel, Iran, Argentina, Venezuela, and Mexico.

Group of mathematics educators receiving NCTM travel grants. Back row: Bill McCallum, Annie Selden, Jerry Becker, Hortensia Soto-Johnson. Front row: Angie Mentges, Kazuko West, Yvonne Lai, Steve Williams.

The aim of ICME–11 was to "show what is happening in mathematics and mathematics education worldwide, in terms of research as well as teaching practices" and to "inform about the problems of mathematics education around the world." Its logo, emblazoned on the requisite tote bags stuffed with assorted Congress materials, was an ingenious Mayan Möbius band.

ICMEs are held every four years under the auspices of the International Commission on Mathematical Instruction (ICMI), which was first established at the International Congress of Mathematicians held in Rome in 1908, with Felix Klein as its first president. In 1952, it became an official commission of the International Mathematical Union (IMU).

The 2008 ICME was a smorgasbord of nine plenary talks and panels; reports of Survey Teams commissioned in advance to study particular topics such as representations and the role of theory in mathematics education research; 60 regular hour lectures in 12 parallel sessions; 38 topic study groups covering topics such as new developments and trends in mathematics education at all levels, gender, task design, and history; and 28 discussion groups on topics such as curriculum reform, promoting creativity, and rethinking the PhD in mathematics education. The program booklet itself was the size and shape of an *MAA Notes* volume.

Monterrey is a prosperous, industrial, Mexican city. One interesting feature was the Parque Fundidora. Constructed on the site of former industrial plants, the opening reception, complete with Mariachis, was held here in a brewery turned museum.

Four Interesting Plenary Panels

The Plenary Panel on the "History of the Development of Mathematics Education in Latin American Countries," had speakers from Mexico, Brazil, Chile, and Cuba. Of the many facts the panelists mentioned, some of the most surprising to me concerned Cuba. Luis Campistrous said that his country's pupils were in school eight hours per day every-day, that some schools have only one pupil and a computer, and that all teachers have technical support.

Just like in the U.S., there is worldwide concern with equity and access, and there was another plenary panel, "Equal Access to Quality Mathematics Education," with speakers from Mexico, Lebanon, and the Philippines. Regarding the latter, I had not realized the extent of the educational difficulties involved in education in a nation of 300,000 square kilometers, 7107 islands, 88.6 million people, 12 native languages, 170 dialects, and seven major ethnic groups. Catherine Vistro-Yu of Manila University said that most math taught is "colonial math" (whatever that is) and that there is a lack of textbooks, but also that teachers are not prepared to teach from textbooks. That certainly is different from the U.S. where teachers tend to stick very close to the textbook.

In a third plenary, Olimpia Figueras of CINVESTAV, a research institute for mathematics education in Mexico City, noted that 13% of Mexico's population, some 12.7 million people, is indigenous. A 1992 reform of the constitution defined Mexico as a multicultural and plurilingual country, whereas previously the country had aimed for cultural homogenization.

While multiculturalism recognizes diversity and leads to a policy of integration in the national society, pluriculturalism recognizes ethnic and linguistic differences as socio-cultural enrichment factors and as valuable resources for society as a whole. Figueras asserted that multicultralism does not offer equal access to education because indigenous language and culture have a different status, whereas pluriculturalism offers equal access to education. In 1990, Mexico set up a study program for indigenous teachers at the National Pedagogical University.

A fourth Plenary Panel reported the results of Survey Team 4 on "Representations of Mathematical Concepts, Objects and Processes in Mathematical Teaching and Learning," and was presented by Gerald Goldin of Rutgers University and

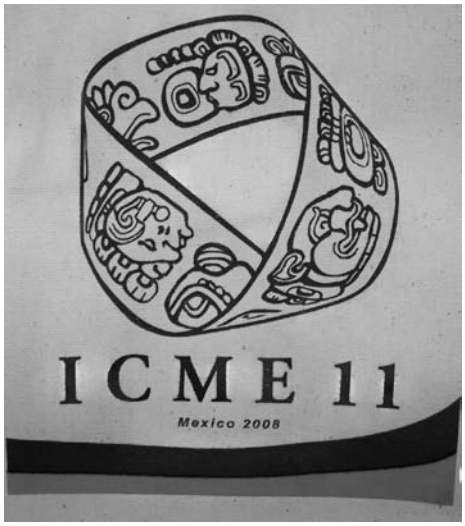
Katrin Rolka of Germany. Some of the central questions delineated by the team were: How do we characterize conceptual understanding in mathematics education? Through multiple representations? As a process of construction of mathematical objects? According to students' understandings in number and numeration, fractions, data representations, etc.? By processes of modeling mathematical situations? By considering affect as a representation encoding information and exchanging information with cognitive systems of representation? By construction of one's mathematical identity?

Many problem-solving studies focus on representations. Different countries make use of different approaches, e.g., the Chinese have a concrete view of average whereas the U.S. uses concrete representations of data. There exist opportunities and pitfalls in using representations: (1) They can increase cognitive load; (2) They include irrelevant aspects; (3) Fluency with representations may indicate conceptual understanding; however, researchers Presmeg and Nenduradu have given an example of a teacher with representational fluency who mixes up linear and exponential functions; and (4) genuine abstraction is not the same as decontextualized representation.

Technology can add dynamics to representations and students can work with multi-linked representations. There are questions about how students relate to new technologies, questions about visualization and imagery, questions about social and socio-cultural perspectives and semiotics. Goldin asked: What is needed is a persuasive large-scale study on the effectiveness of representations. For example, what's most effective? Number line models or area models? Also, what is representational power and how does one measure it?

Two Interesting Regular Lectures

Samuel Antonini of University of Pavia in Italy gave the Regular Lecture, "Generating Examples: An Intriguing Problem Solving Activity." He reported on his research project that involved task-based interviews of secondary students, undergraduates, and PhD mathematics students



The ICME 11 logo.

doing various problems that started "Give me an example, if possible, of …" One such problem was "Give me an example, if possible, of an injective function on [–2, 2] whose limits as x approaches –2 and as x approaches 2 are equal."

Antonini is interested in what strategies students use to generate examples. After briefly mentioning trial and error, he discussed two additional strategies: a transformational one and an analysis one. In the transformational strategy, students produce an initial example, and upon realizing it does not satisfy at least one of the required properties, modify it.

In the above example, students at first said such a function could not be produced because they had implicitly assumed continuity, but after being urged to look again, they realized continuity was not one of the requested properties. Such modification can be done several times, in a way reminiscent of successive approximations. In the analysis strategy, students assume there is such an example, consider what properties it must satisfy, and then try to produce it. Most students use a combination of the transformational and analysis strategies.

Anna Sfard, of the University of Haifa and Michigan State University, presented the Regular Lecture, "Learning Mathematics as Developing a Discourse." With a philosophical turn of mind and never one to think small, Sfard began by asking how we should deal with the complexity of learning processes. She interspersed her philosophical remarks within an example of two four-year-olds, Roni and Eynat, who were given two identical closed boxes containing marbles and asked which box had more marbles. Without looking or counting, they agreed it was Box A. When asked, "How do you know?" they simply said Box A was "more huge." They had to be urged to count (correctly) the marbles in each box.

This prompted Sfard to ask: What is a number and where is the child supposed to find it? Her answer: Number is a discursive construct people created to communicate about the world. It is to be found in discourse, not in the world. She also asked, if learning is change, what is it that is supposed to change when a person learns mathematics? Her answer: Thinking changes, but what is thinking? To this she replied: It is communication, with the caveat that communication does not have to be verbal. This led her to introduce the notion of "commognition" for a blend of communication and cognition, which in turn, led her to the view of mathematics as discourse. So what does it mean to learn mathematics? Her answer: It means changing the discourse. This interesting, and perhaps unusual, view is developed further in her book, *Thinking as Communicating: Human Development, the Growth of Discourses, and Mathematics*.

With the plethora of sessions, there was enough for all participants to find something of interest at ICME–11. The next International Congress on Mathematical Education, ICME–12, will be held in Seoul, Korea, July 8–15, 2012.

Annie Selden is Professor Emerita at Tennessee Technological University and Adjunct Professor at New Mexico State University.

Play Review: *A Disappearing Number*

By Barbara A. Jur

Theater has discovered mathematics as a plot theme. A new British play, *A Disappearing Number*, by Simon McBurney, has joined the ranks of *Arcadia* (1993), *Proof* (2001), and the films *Good Will Hunting* (1997) and *A Beautiful Mind* (2001) as drama with mathematics playing a significant role.

A scene from A Disappearing Number. *Used by permission of Complicite.*

The source of much of the play's action is the interaction between Ruth, a university mathematician, and Al, an American/East Indian futures trader, who pursues and marries Ruth despite an almost total incomprehension of what she does. In parallel, we see the story of the collaboration of Srinivasa Ramanujan and G. H. Hardy.

In *A Disappearing Number,* the audience has the opportunity to see real mathematics — specifically number theory. In fact, the actors admit that nothing is real about the play except for the mathematics, which is present in the play to a much larger extent than in *Good Will Hunting,* with its brief glimpses, or *Arcadia,* in which the equations described in poetic terms but never seen, or *Proof,* in which we only hear of the process of working out "lumpy," or "elegant" solutions to problems. Ruth is seen lecturing on one of Ramanujan's results, which she presents in its entirety on a white board. When she encounters Al, she tries to explain what she does by talking about sums of sequences, which gives the audience a hint, if not full understanding, of the direction the mathematics is taking.

The staging was a strong element of the production. Although the stage was almost bare, there was a wall and a flip board dividing the stage front to back. The wall functioned variously: as a projection screen for action clips of city scenes in India, as white board, and as a scrim that allowed action to be observed in the front and rear of the stage simultaneously. The flip board allowed actors to pass from the front to back of the stage and off the stage. This provided an amazing and continuous flow to the story line.

Cultural divides permeate the tension among the characters — like invisible walls. Hardy and Ramanujan were separated by their approaches to mathematics. Ramanujan was self-taught and did not see the need for proofs. Hardy was a formalist who struggled to understand the insights of his Indian colleague. Al and Ruth struggle to understand each other's work. Al happens to be of East Indian descent and has interactions with others who have a similar heritage. He has a recurring encounter with the customer service representative of his cell phone company, who is heard as a voice over. He wants to change his phone number to his deceased wife's number, 1729. Company policy does not allow it, as "Barbara Jones" explains. She has a pronounced Indian accent despite her English name. They have several funny conversations until the end of the play when she tells him that she has lost her job because the company is recalling the office to England. Her name is Lakshmi.

The play is often funny, but ultimately it is about loss. Ramanujan dies. Ruth dies. Lakshmi loses her job. How we choose to deal with such losses may give them meaning. Hardy worked on explaining his protégé's mathematics. Al reconnects with his roots by journeying to India where Ruth died. He also discovers the significance of 1729.

The play is staged by *Complicite*, a British Company. It is an amazing production which combines action, dialog, staging, Indian music, and video in a thoroughly engrossing performance. If you have an opportunity to see *A Disappearing Number*, do not miss it.

Barbara A. Jur is Associate Dean of Mathematics and Science at Macomb Community College in Warren, MI. This review is based on a showing of the play at the University of Michigan.

A Disappearing Number

Directed by Simon McBurney with music by Nitin Sawhney

Prizes:
Laurence Olivier Award 2008 for Best New Play
Evening Standard Award 2007 for Best Play
Critics' Circle Theatre Award 2007 for Best New Play

Currently on tour in Australia; there are plans to bring the play to New York in the Fall of 2009.

An adaptation for radio was presented by the BBC on September 21, 2008.

Presented by Complicite; see http://www.complicite.org for more information about this and other productions.

On the Cover: The Dome

By Mehrdad Garousi

At first glance, this work reminds us of the interior tiling of Islamic mosque domes. In these mosques, tiles and forms on the sides of the dome view seem smaller due to spherical shape and much smaller as we approach the center, which is more distant. But this image, on a flat surface, goes beyond and continues this tiling not to the dome center but to infinity. As we move toward the inside of the picture, the tiles get smaller in a fixed ratio to the previous tiles and keep their coherence and continuity in a certain ratio as well, making the image fractal.

As in Islamic tiling, color plays a key role in this work, increasing the clarity of forms like flowers or stars in the tiles. Here the very small basic rectangular and triangular mosaics make hexagonal and six pointed star flowers, all of which match side by side and create an infinite seamless texture with a nice self similarity at the center. Notice that the colors of the mosaics in the image are like the colors used in real dome mosaics: orange, lemon, amethyst, blue, pink, and grass green.

(Used by permission of the artist. See http://mehrdadart.deviantart.com/ for more of Garousi's work.)

Marcus du Sautoy Hopes to "Turn People On" to Mathematics

Oxford Mathematician Marcus du Sautoy has been named the new Simonyi Professor for the Public Understanding of Science, a post held by biologist Richard Dawkins until his recent retirement. The new position, which took effect on December 1, 2008, recognizes and supports du Sautoy's work as a popularizer and expositor of mathematics

As a number theorist, du Sautoy has done significant research on such things as zeta functions, elliptic curves, and *p*-adic Lie groups. He is the author of two books for the general public: *The Music of the Primes*, which is a tour of number theory centered on the Riemann Hypothesis, and *Symmetry: A Journey into the Patterns of Nature*, whose UK title, *Finding Moonshine*, reveals it to be about the mysterious connections between distinct mathematical embodiments of the notion of symmetry: groups and modular forms. A third book, entitled *The Num8er My5teries: A Mathematical Odyssey Through Everyday Life*, is forthcoming in 2009. In addition to books, du Sautoy has written many newspaper articles and columns, participated in television programs, and undertaken many other activities in the world of culture. He was the mathematics advisor for the play *A Disappearing Number* (see page 12). His web site, at http://people.maths.ox.ac.uk/~dusautoy/, has separate sections on "left brain" activities (communication of all sorts) and "right brain" activities (research in mathematics).

Marcus du Sautoy. Photograph by Niall McDiarmid.

The aim of the Simonyi Professorship at Oxford is "to communicate science to the public without, in doing so, losing those elements of scholarship which constitute the essence of true understanding." It was established in 1995 by a donation from Dr. Charles Simonyi, and was first held by Richard Dawkins. The new appointment was announced on October 28; see http://www.ox.ac.uk/media/news_stories/2008/081028.html.

In an interview with the *Guardian*, du Sautoy said that he feels "a bit of geek chic is coming in" and hopes to be able to get people excited about mathematics: "I don't want to preach to the converted, I want to capture the people who say they hate maths. I see people like that as a challenge. Once you show them it's not a load of boring multiplication and long division, you can say it has beauty and aesthetics and excitement and drama and emotion. Those are things I think might turn people on."

Archimedes Palimpsest Data Released

On October 29, exactly ten years after a private American collector purchased a Greek manuscript containing several works by Archimedes, the Archimedes Palimpsest Project announced that their data would be released online for the use of scholars. The manuscript is a palimpsest, which means that the parchment pages have been washed and new text written over the older material. With special imaging techniques and a lot of work, it is possible to read the older text, which in this case contains work by Archimedes and others. The history of the manuscript and the story of the efforts to restore it and read the underlying text are told in a wonderful book for "the general public," *The Archimedes Codex*, by Reviel Netz and William Noel (Da Capo Press, 2007; see MAA Reviews for more).

More information on the palimpsest and the associated project can be found at the project's web site at http://www.archimedespalimpsest.org. The dataset itself is available at http://www.archimedespalimpsest.net. The dataset was published under a Creative Commons 3.0 attribution license, which assures it can be easily accessed and used. In fact, a complete facsimile of the revealed texts is available on Googlebooks as "The Archimedes Palimpsest."

Teaching Introductory Data Analysis Through Modeling Workshop

By Jean Scott

Going to JMM? The Consortium for the Advancement of Undergraduate Statistics Education (CAUSE), in conjunction with SIGMAA Statistics Education, is very pleased to offer an MAA Auxiliary Workshop on Sunday, January 4, 2009 — the day preceding the Joint Mathematics Meetings in Washington, D.C. The presenter for the workshop is Danny Kaplan of Macalester College. The intended audience is teachers of introductory statistics in colleges and universities.

This hands-on workshop will present a new way of teaching introductory data analysis that gives a central role to modeling techniques. Modeling provides a strong unifying framework for statistics and at the same time ties statistics closely to the scientific method and the demands of realistic multi-variable data. The workshop will introduce the ways in which models can be used for description, the interpretation of models in terms of association, change, and partial change (that is, change in one variable while holding others constant). In place of the usual matrix-based theory of linear models, the workshop will present a geometrical approach to theory that is accessible to introductory students and fully illuminates important ideas in data analysis: fitting, confounding and Simpson's paradox, correlation and collinearity. Inference is introduced using resampling and simulation, from which it is straightforward to transition to a general framework for inference, analysis of covariance. Computation (using the free package R) will feature prominently in hands-on activities; participants should bring laptop computers if possible. Participants do *not* need to have previous experience with R or with statistical modeling. Our students can learn it and so can you!

Logistics: Sunday, January 4, 2009, 8:30am–5:00pm at the Marriott Wardman Park Hotel located at 2660 Woodley Road, NW Washington, District Of Columbia. There is no registration fee for this workshop. Workshop materials and lunch during the workshop will be provided. Workshop participants are encouraged to bring their own laptops. Workshop participants are responsible for their own transportation and lodging. Be sure to register for JMM and book your rooms early through their lodging service to obtain conference rates for your JMM stay. Enrollment is limited to 40. For registration and additional details go to http://www.causeweb.org/workshop/modeling_jmm09/

Jean Scott is Program Coordinator for CAUSE. She can be reached at jscott@stat.osu.edu.

Enhancing Diversity in Graduate Education (EDGE)

The EDGE Program was launched in 1998 by Bryn Mawr College and Spelman College with the goal of strengthening the ability of women students to successfully complete graduate programs in the mathematical sciences, with particular inclusion of women from minority groups. The 2009 EDGE Summer Program will be held June 8 to July 3 on the campus of Spelman College with local coordinator Fred Bowers and national co-directors Sylvia Bozeman and Rhonda Hughes. The EDGE Program provides courses in analysis and algebra, a topical mini course, guest lectures, and advanced graduate student mentors. The Program also provides follow-up mentoring and networking opportunities throughout the academic year.

EDGE 2006 Participants, Staff, and Faculty, New College, Sarasota, Florida.

Applicants to the EDGE Program must be women who have applied to graduate programs in the mathematical sciences for Fall 2009. All applicants should have completed standard junior/senior-level undergraduate courses in analysis and abstract algebra and expect to earn a PhD in the mathematical sciences. Participants are provided travel, room and board, a stipend of $2,000, and a small research fund.

Applications should include: (1) a completed application form; (2) a personal statement; (3) two letters of recommendation from mathematics faculty; (4) a transcript; (5) a current resume; and (6) a ranked list of graduate programs to which the applicant has applied. For application materials and more details, visit the website at http://www.edgeforwomen.org/. The deadline for applications is March 6, 2009.

In Memoriam

Andrew Gleason died on October 17, 2008, at the age of 86. Born in 1921, Gleason showed a talent for mathematics early on. He graduated from Yale in 1942, and then enlisted in the Navy to do cryptographic work. In 1946, he was appointed to Harvard's Society of Fellows. He was still a Junior Fellow when he did his work on Hilbert's Fifth Problem, which established him as an important mathematician.

Gleason reenlisted in 1950 to do cryptographic work during the Korean War. The details of his activities are (of course) not known, but rumor has it that he was not surprised by the revelations to be found in the famous "Venona" transcriptions of Soviet communications.

After the war, he returned to Harvard, was promoted, and eventually was named Hollis professor of Mathematics and Natural Philosophy. The Mathematical Genealogy web site lists eighteen PhD

students, including several well-known names. (The list may well be incomplete.) Gleason retired in 1992.

As a mathematician, Gleason is best known for his work on Hilbert's Fifth Problem, which he solved together with Deane Montgomery, Leo Zippin, and Hidehiko Yamada. He was a remarkable and inspiring teacher, known for his careful course notes. He was generous with ideas and wore his immense knowledge very lightly. Everyone who interacted with him came to respect him.

Gleason was always interested in teaching. Beginning in the mid-1980s, Gleason became involved in "calculus reform." This eventually led to the "Harvard Calculus Consortium" and the calculus textbook that he co-authored with Deborah Hughes Hallett and others. People who interacted with Gleason during that period remember his deep interest renewing calculus teaching, his sharp analyses of what was essential (and what wasn't) in a calculus course, and his willingness to put his prestige behind what was still a controversial project.

Gleason was a longtime member and supporter of MAA. In 1996 he received the MAA's highest honor, the Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics.

The MAA Peru Study Tour

The MAA's study tour and exploration of Peru began on July 7, 2008. Twenty five study tour enthusiasts were led by Doug Sharon, former director of the Hearst Museum of Anthropology at UC-Berkeley, and Carrie Brezine, khipu database administrator at Harvard University. The group examined khipu at the Anthropology and Archaeology Museum in Lima, visited the Gold Museum for a look at an extraordinary private collection of cultural artifacts, and viewed mathematical texts at the Biblioteca Nacional de Peru.

A flight over the famous Nasca Lines in four and six seater airplanes was a highlight for many. Seeing the hummingbird, lizard, monkey, and condor brought to life the strange and unusual way in which these figures were carved into the soil centuries ago. Machu Picchu, high in the Andes, and higher yet, the city of Cusco, at 12,000 feet, was base camp while the group enjoyed the archeoastronomical aspects of this area.

A visit to Quito, Ecuador and its surroundings plus a five day sail in the Galapagos Islands was enjoyed by 13 adventurers, all of whom received their "Equatorial Line Diploma" while on board the *Galapagos Legend*.

The group at Machu Picchu.

The seventh annual MAA Study Tour will be a visit to Egypt from May 20 to June 1, 2009. Contact Lisa Kolbe at lkolbe@maa.org or by phone at 202-293-1170 for more information.

An Amazing Trip

By Gordon Swain

This trip was amazing! I had been to Peru before, and am planning to lead a student tour there next year, so this should have been just a professional experience. But after two meals and a few half-hour trips on the bus in Lima, I was smitten with this gang of not-so-nerdy mathematicians (and other sorts).

Peru did not let us down: the highlights for me were flying over the Nazca Lines, tromping around the Inca ruins at Pisac, and the austere beauty of the Ballestas Islands. And my favorite mountains, the Andes, were themselves worth the trip.

We'd read that the pre-Columbian peoples of Peru had no written language but, along with the khipu, which held their numerical stories, their pottery and textiles spoke volumes. Their artistic expression through everyday objects portrayed in extreme detail the flora and fauna, the emotion, worship, pride, along with their daily toil. You just had to see it all.

The tour was incredibly well organized and the leaders were great, generous with their knowledge, advice, and coaxing, and remarkably adept at herding faculty. Traveling with a group let me see through other eyes what I took for granted in Latin America. I highly recommend joining one of these MAA tours.

Gordon Swain and Pat Trafton aboard for a flight over the Nazca Lines.

Free tour advice:

- Look deeper — there were so many layers beneath what we'd read about Incas and Spaniards, and we could only really appreciate it through the eyes and voice of their people.
- Listen to the leaders — I ignored the bug spray advice and at Machu Picchu enough bugs (re)discovered me that I brought back a Southern star map on my legs.
- bring lots of good batteries — I'm crying over the gaps in my photo album.
- The people make the trip — I believe these folks could have spent a week anywhere, had way too much fun, and found *something* to buy!

Gordon Swain is Professor of Mathematics at Ashland University in Ashland, OH.

Going to Peru with the MAA

By Jonathan Kane and Janet Mertz

Janet and I had always thought of Peru as one of the more interesting locations in South America. On the other hand, it is a place we would not go on our own, so we decided to give the MAA Study Tour a try.

In Lima, we enjoyed learning about the long history and culture of the local Indian civilizations and the Spanish invasion. We saw about as much ancient pottery and as many quipu as we could stand, but the combined effect contributed substantially to our understanding of Peruvian history and culture.

Having never been in a four-seater airplane before, our flight over the famous Nazca Lines was a combination of impressive scenery, surprising pictures in the dessert, and thrilling amusement park ride. We were thankful our flight was before lunch.

A definite highlight of the tour was the two hour boat trip to the Ballestas Islands, heavily populated by pelicans, cormorants, boobies, sea lions, and penguins. The sheer number and density of birds was breathtaking. We learned about the harvesting of the guano, and several of us were rewarded with our own fresh sample. I shot 100 pictures in an hour.

Our trip into the Andes to see Incan ruins and learn about native weaving techniques gave an appreciated change of pace and scenery. The Incan structures at Pisca and Machu Picchu were every bit as spectacular as advertised, and we enjoyed the increased hiking opportunities they offered.

Jonathan Kane and Janet Mertz with the pilot prior to their flight over the Nazca Lines.

Cuzco is a beautiful city full of Incan and Spanish history and culture. It was great to wander through the indigenous market seeking sweaters, foods, and Andean flutes. We spent five minutes at a street corner discussing which direction was east after one of us forgot that the sun was, for the first time in our lives, to the north.

Traveling with academics, and with mathematicians in particular, was comfortable from the very beginning because our shared backgrounds and language made bonding easy. The tour managers took very good care of us, and in spite of some very long days, too much good food, and a couple of bouts with travelers' ailment, it was a great experience.

Jonathan Kane is Professor of Mathematics at the University of Wisconsin Whitewater. Janet Mertz is Professor of Oncology at the University of Wisconsin Madison.

Peru Study Tour

By Ralph Czerwinski

Although I didn't know it at the time, my Peruvian journey actually began at MathFest in San Jose when my graduate school friend, Ralph Neuhaus, declared he was looking for a post-retirement adventure. When the MAA announced its Peru Study Tour, I knew a Machu Picchu adventure awaited us.

Also awaiting us were museums, historical sites, and archaeological sites along the coast of Peru and peaks of the Andes. Because our main guide, Doug Sharon (retired Director, Hearst Museum of Anthropology/UC Berkeley), had lived and worked in Peru for ten years, he was able to provide us with enthusiastic and detailed insights into the cultural heritage and history of Peru. From the moment we visited the Anthropology and Archaeology Museum in Lima, I became enamored with the ceramic pottery of ancient Peru which was amazingly varied and rich in symbolic depictions.

Ralph Czerwinski with Peruvian dancers.

Carrie Brezine (PhD candidate, Harvard University) is an expert on khipus and the traditional weaving

techniques of the Andean cultures. I was intrigued by the connections between math and art seen in the natives' traditional weaving techniques and in the symmetry patterns of their finished weavings.

One of our local guides, Tino, was very informative and charismatic. He provided us with some wonderful and entertaining insights into Peruvian culture through his rituals at the archaeological sites and stories attributed to his native Indian grandmother. He spoke from experience about the present-day cultural mix in Peru (his other grandparents are of Spanish, Chinese, and Italian descent).

Although a 24-hour flu prevented me from visiting Chincheros, a small Andean town known for its pottery and weavings, the day was redeemed by a stroll around Urubamba where I interacted with the teachers and students at an elementary school. They were appreciative of the ballpoint pens I had brought along as gifts and they gave me an energetic, friendly response that was renewed throughout the day as I encountered the children on the streets after school.

Lonesome George – The Last of a Species at the Darwin Research Centre, Santa Cruz. Photograph by John Wilkins.

And, of course, Machu Picchu! The site of the city ruins and the impressive workmanship of the stone work at the site made for a breath-taking, awe-inspiring experience. The site was much larger than I had envisioned and the quality of the restoration of the site was truly remarkable.

The well-organized trip was an adventure filled with information, cultural interaction, scenery, and food for thought and stomach — topped off with the Peruvian cure-all, cocoa tea.

Ralph Czerwinski is Professor and Dean Emeritus at Millikin University and a former Governor of the Illinois Section of the MAA.

South of the Equator and Back Again

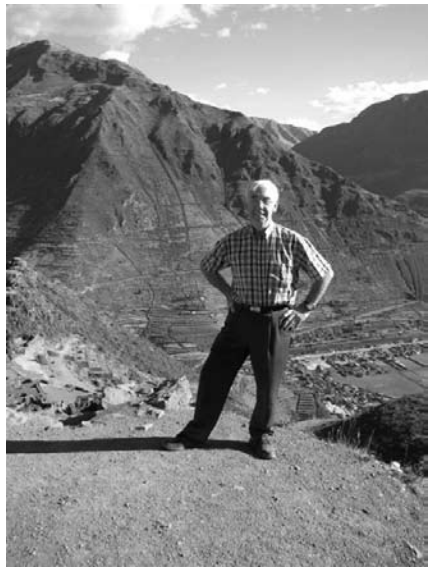
By Mike Bankhead

An MAA program guide arrived, and on the back page I noticed an ad for a study tour to Peru with a pre-trip to the Galapagos Islands. The Galapagos, traveling south of the equator, and going on a tour were all on my list of things I want to do before popping upstairs for eternity, so I applied. I took an exercise book with me to keep a log of everything I did each day throughout the trip because the itinerary looked packed. I would urge everyone going on a tour to do the same, just don't stop writing in it after the third day.

The trip to Quito, Ecuador, was delayed and long but otherwise uneventful. I met up with 11 other mathematicians at breakfast the following morning. The first day in and around Quito was long and hectic, but enjoyable, then on to the Galapagos Islands. The cruise ship was small, only 100 passengers, but the crew went to extraordinary lengths to meet our needs. Each morning we were fed, fitted with life jackets, popped into *pangas*, the dinghies that took us from the ship to the shore, and dropped off on an island with a guide. After snorkeling or trekking across an island, we then returned to the ship and the same thing happened again each afternoon. On days when we were going to snorkel, we battled our way into a wet suit, before donning the life jacket, and then the routine was the same. While iguanas and blue-footed boobies were everywhere, we also saw some less common forms of wildlife, and even Lonely George was obligingly sitting in the middle of his pond easily visible to us all.

Then on to Lima; we arrived at the hotel and met up with another thirteen mathematicians the following morning. Then the mathematical part of the tour began. We studied khipus: strings joined together with knots in them — the Inca information recording system. But there was also plenty of time to visit a large number of famous places all over Peru.

In spite of the fact that it was a mathematics study tour, for me the best part of the entire trip was being on a boat near Ballestas Islands surrounded by tens of thousands of cormorants sploshing about in the sea and flying low all around us. Machu Picchu came in a very close second — a photo cannot do it justice. Overall I have been left with some wonderful memories of this hectic trip, not only because of the places I saw, but because of the fact that the folk I was with were also mathematicians.



Mike Bankhead in the Galapagos Islands.

Mike Bankhead teaches at Bellarmine University in Louisville, KY.

The Dangers of Dual Enrollment – More Cause for Concern

By Theresa A. Laurent

After reading David Bressoud's article on "The Dangers of Dual Enrollment" in the December 2007 issue of *MAA FOCUS*, and given that my institution, the St. Louis College of Pharmacy, grants credit for students who complete a dual enrollment calculus course in high school, I felt compelled to investigate the calculus achievement for our entering freshmen.

Although my institution is small and specialized, of the 238 freshmen admitted this fall, 145 had just taken a calculus course in high school. Of those students, 50 earned credit for Calculus I by dual enrollment grades of C or better or AP Calculus AB scores of 4 or better. This seemed to be a nice population to investigate differences between students who earn credit by AP Calculus Exam versus students who earn credit by dual enrollment versus student who take calculus in high school but do not earn college credit.

Two days prior to the start of the fall semester, 143 freshmen with high school calculus experience completed a validated calculus-based placement test. The test was a modified version of the Calculus Validation Exam developed at the U.S. Military Academy — West Point; this exam was described in "Calculus Placement that Really Works!" (*MAA FOCUS*, January 2008). The modified test consisted of 16 questions worth a total of 29 points.

Students were categorized based on their earned credit status using the following definitions:

No Credit: Took a calculus course in high school but did not earn college credit for Calculus I;
AP Calculus AB ≥ 4: Earned credit for Calculus I with an AP Calculus AB score of 4 or higher; and
Dual Credit: Earned credit by successfully completing a dual credit course with a grade of C or higher.

Scores ranged from 0 to 21 out of a possible 29 with a mean of 5.48 and standard deviation of 5.00. The low mean should not be surprising, since students did not prepare for this exam and most of them had no exposure or practice with calculus over the summer. Additionally, the majority of these students registered to re-take Calculus I in their first semester of college. For those students who earned credit for Calculus I, however, these scores are disturbing.

Results by earned credit status are shown in the table on this page. The differences in means are striking with the AP Calculus group having the highest mean by far. Additionally, comparing means of the No Credit group and the Dual Credit group show no statistical difference.

Several explanations of the poor performance of the Dual Credit group were considered. For example, the groups were compared controlling for Math ACT scores; no major differences were found in the results. Grades of the Dual Credit students were reviewed to see if there was an unusually large number of Cs in the group. No: 20 students earned an A, eight students earned a B and only one earned a C.

Since so many students at the St. Louis College of Pharmacy come from the surrounding area, I was concerned that maybe just one higher education institution was awarding dual credit to several of the students without appropriate standards and thus skewing the results. However, dual credit transcripts represented 16 different higher education institutions in the Midwest. In fact, 17 of the 28 dual credit students had earned their credit from institutions with accreditation or provisional accreditation from the National Alliance of Concurrent Enrollment Partnership (NACEP).

The results of this investigation were strong enough for our institution to change its credit granting policies for Calculus I. In Bressoud's article, he pointed out that mathematics departments' involvement in many dual credit programs lack oversight. If dual credit is to be taken seriously by higher education institutions, it is imperative that college mathematics departments take more responsibility in the administration and oversight of these courses.

Theresa Laurent is an assistant professor of mathematics at the St. Louis College of Pharmacy. This research was done as part of her dissertation at the University of Missouri – St Louis.

Means and Standard Deviations of the Modified Calculus Validation Exam by Earned Credit Status (No Credit, AP Calculus AB ≥ 4, Dual Credit)

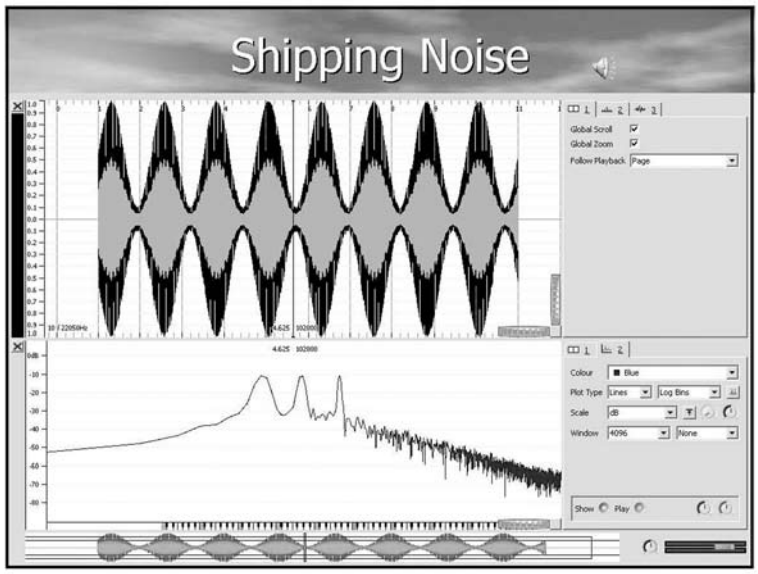
Earned Credit Status	*Number*	*Mean*	*Standard Deviation*
No Credit	93	4.17	3.70
AP Calculus AB ≥ 4	22	12.14*	5.57
Dual Credit	28	4.61	4.28

** Mean was statistically different from other groups, $p \leq .01$.*

What We Learned... by Starting a Seminar Series at a Small School

By Isaiah Lankham and Jenny Switkes

Imagine that you recently started teaching at a small college or university in a rural area. Armed with memories of mathematics seminars and colloquia from past schools, your enthusiasm is high for starting something similar at your new school. You soon realize, however, that this seminar will not look quite the same as it did at any of the large universities where you have previously been. In this article, we describe the unexpectedly great things that happened as we grappled with this problem and found unique opportunities at Simpson University in Redding, California.



One of the slides from Michael Huster's seminar.

The Setting

Simpson University is a small Christian liberal arts university in Northern California. We offer majors in mathematics and mathematics education, and our mathematics students are enthusiastic and a joy to teach. However, until this past year, our mathematics majors had not been exposed to such almost-legendary staples of study as the Putnam Mathematical Competition, summer REU programs, seminar series in mathematics, etc. This past year, with a number of our students interested in graduate study in mathematics, with both co-authors newly arrived at Simpson, and with the expressed support of our Simpson colleagues, it was a good time to start new things. Among other projects, a mathematics seminar series was begun.

Our Speakers

Simpson University is located in a fairly rural area, with neighboring four-year colleges and universities located more than an hour away. As a result, it was simply impossible to invite a full schedule of mathematicians from other schools, as both co-authors had been used to doing. So *we* gave talks: Isaiah spoke on "A User's Guide for Fixing Elections with Discrete Mathematics"; Jenny spoke both on "Summer Math Research Adventures" and on "Perceived Highway Speed;" mathematics colleague Harold Lund opened our seminar series with "A Fun Introduction to Topology"; and physics/mathematics colleague Michael Huster drew from his sonar design experience when he spoke on "Noise, Noise Everywhere and Not a Sub to Sink."

We also brought in Simpson faculty colleagues from other disciplines: Michael Lyons, a professor of Old Testament, spoke on "Numbers and Number Usage in Ancient Israel"; and Wally Quirk, a professor of business administration, spoke on "Expansion of the Money Supply."

We invited students to give talks: Senior psychology major Jillian Ducker spoke on "An Investigation of the Influence of the Simpson University Culture on Selected Characteristics of Emerging Adults," and senior mathematics education majors Kaela Corbet, Michelle Long, and Ashley Mathis jointly gave a talk entitled "Factors Influencing Post Graduate Aspirations." Both talks were based upon year-long research projects directed by our mathematics colleague Mel Shuster.

We did invite speakers from "nearby" UC Davis, which is about two and a half hours away from Simpson University. UC Davis senior mathematics major Paul Prue drew from his most recent REU project when he spoke on "Geometric Approaches to Hyperspectral Imaging," and mathematical physicist Craig Tracy, who was Isaiah's dissertation advisor, spoke on "Universality in Mathematics and Physics."

Our Audience

Our next challenge was to build an audience for our seminar series. In order to have a consistent core audience, we offered a newly created one-unit course that students could take for pass/fail credit. Five students enrolled in this course and were required to attend at least nine of the twelve seminar talks. We also required students to take notes at each talk and to turn in their notes at the end of the semester. In addition, we required them to write one-page response essays for the three talks that they found most interesting.

A sign-in sheet was also prepared for each talk, which enabled us to keep a record of both enrolled students and non-enrolled guests. We actively invited and often had non-mathematician faculty, administrators, and staff attend. Guests included the President of the University, recent Simpson alumni, students

from a wide variety of non-majors courses (including one Intermediate Algebra student), and a friend of Jenny's who, among other things, works as a gardener at Simpson. And, of course, our mathematics and science colleagues were also strong supporters and attendees of the seminar.

The newly created Math Club played an important role in building this audience. Math Club President Rebekah Hoffman designed professional-looking flyers for us, which allowed us to advertise to the entire Simpson campus community. She also coordinated thank you cards for each speaker and had the audience at each talk sign them.

We held the seminar on Monday evenings in a conference room located within the campus dining center. Attendees were welcome to bring their dinner to each talk. This created a fun, informal atmosphere for the seminar.

Results of Our Seminar

Our audience included more than just those who could attend in person. We posted speakers' slides online, and we found that a number of faculty and administrators from across the university accessed these slides. In addition, several other departments either have created or are in the process of creating a seminar series in their own disciplines.

We found that students also genuinely enjoyed the seminar and felt that they learned a lot from it. Based upon their response papers, they especially enjoyed seeing ties between mathematics and other fields of study through presentations by faculty whom they already knew in other contexts. Students were additionally inspired both by presentations from fellow students and by our off-campus faculty guests, the latter in particular pointing them towards graduate-level mathematics.

Our last meeting was a Math Club co-sponsored "Pizza, Puzzle, and Pi(e) Party" during final exam week. The Mathematics Department provided funding for pizzas and pies, and we encouraged attendees to bring a "silly pi trick to share." Jenny shared MATLAB code for approximating π using the Taylor expansions

$$\pi = 4\left(1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\cdots\right) \text{ and}$$

$$\pi=6\left(\frac{\sqrt{3}}{3}-\frac{(\sqrt{3}/3)^3}{3}+\frac{(\sqrt{3}/3)^5}{5}-\frac{(\sqrt{3}/3)^7}{7}+\cdots\right),$$

the latter providing astonishingly better approximations for π upon truncation, and using a Monte Carlo method based upon the integral

$$\pi = 4\int_0^1 \sqrt{1-x^2}\,dx.$$

Isaiah brought some lighter pi fare, including such standard piphilogical "pi-ems" as

> How I wish I could recollect of circle round
> The exact relation Archimede unwound
>
> (source: http://paginas.fe.up.pt/~fsilva/port/pi2.html)

and "pi-kus" like

> Pi — ratio of
> Around : across a circle —
> An endless number?
>
> (source: http://www.exploratorium.edu/pi/Pi-Ku/)

We were also delighted to have a colleague illustrate the concept of circumference in non-Euclidean geometry, and a student was kind enough to entertain us with such song parodies as "American Pi," the refrain of which includes the first 30 digits of π. It was a fun end to a fun semester of talks, and we will certainly continue the tradition.

For Next Time

Overall, we are extremely happy with how this first mathematics seminar series went. There were some minor issues, though. No formal prerequisites were placed on the accompanying one-unit course, and one student did enroll who was not at all suited to the course. Next year, we will most likely deal with this by adding a suggested prerequisite of calculus. Although the dinner-time meetings created a nice atmosphere for talks, it prevented student-athletes and faculty from a nearby community college from attending. It may be necessary to experiment with a different time of day. As far as speakers go, several additional Simpson faculty colleagues have already volunteered to speak about interesting things in their discipline that in some way connect to mathematics. We are sure that the mathematics and science faculty will also continue to contribute to the seminar series, and we like how it went with undergraduate student speakers as well.

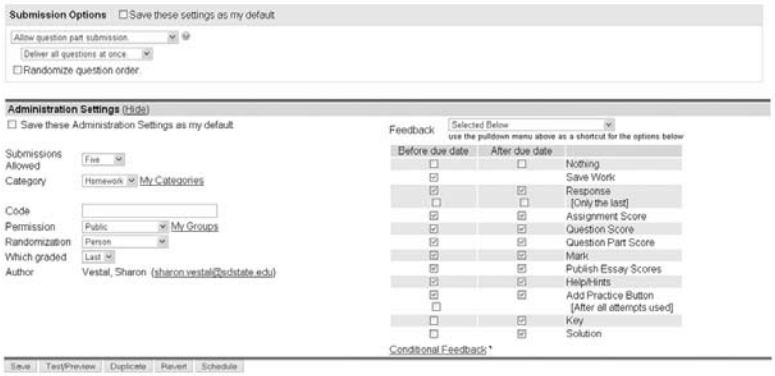
Our new seminar series was a success. We believe it is important that we were willing to relax our ideas of what a seminar series in mathematics "should look like" and to tailor the seminar series to the culture of the university, while realizing that this seminar represented something new and unusual at our university. As a result, things that initially seemed to be difficulties led to some of the most special aspects of the seminar!

*Isaiah Lankham (*ilankham@simpsonuniversity.edu*) recently completed his first year as an Assistant Professor of Mathematics at Simpson University in Redding, California, where he started Simpson's new Mathematics Seminar and brought other exciting new things to Simpson's enthusiastic mathematics majors. Jenny Switkes (*jmswitkes@csupomona.edu*) is an Associate Professor of Mathematics at California State Polytechnic University, Pomona; during an academic year off in Northern California, she taught part-time at Simpson University and helped Isaiah start the seminar.*

What I Learned... by Using an Online Homework System in Calculus I

By Sharon Vestal

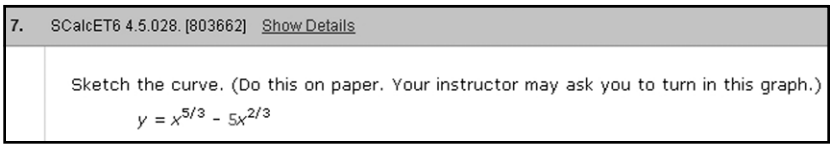
During the 2006–2007 academic year, I taught one Calculus I course each semester. While I believe that students do better when they have graded homework, it seemed to be the practice of many faculty members to give quizzes but not collect homework. Since I had just moved, started a new job, and had a baby, I decided that I didn't really have time to grade homework so I would succumb to peer pressure and give quizzes. I also assigned 'projects,' which essentially are more difficult homework problems.



WebAssign assignment settings.

What I observed was not too surprising: my students were not doing much homework; and as a result, they were not doing well in the course. In Spring 2007, we decided to adopt the new edition of Stewart's *Single Variable Calculus Early Transcendentals* and I found out that we could use an online homework system with this textbook. I volunteered to be the 'guinea pig' for the department and use *Enhanced WebAssign* to assign and grade homework for this course. One of my colleagues also used it for some of the homework in his class. In Fall 2007, I had two sections of Calculus I and I used *WebAssign* for both sections.

I spent time in the summer of 2007 putting together all the homework assignments for the course. Luckily the problems in the new edition of Stewart are similar to those in the old edition, so I already knew what type of problems I wanted to assign. However, I was a bit disappointed when I went to select problems that involved graphing, such as 'sketch a graph that has the following characteristics,' because those problems were not available in the *WebAssign* database. They have problems such as the following.



If these were assigned for points, they would have to be graded by hand. The support people at *WebAssign* suggested that I supplement problems that were missing from their database by adding directions to each appropriate *WebAssign* assignment, such as 'In addition, do the following problems from the textbook.'

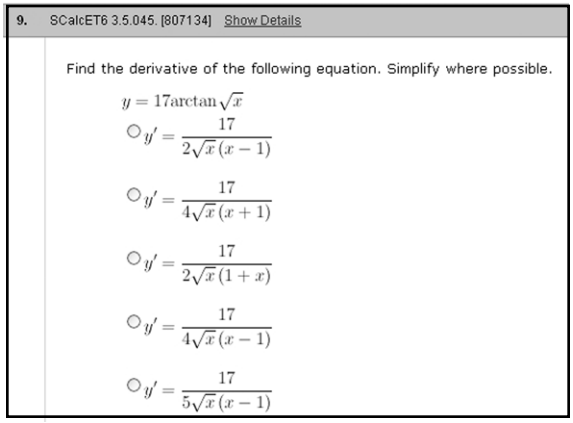
The problem with this approach is two-fold: students don't always read directions; and how would these problems get graded? I decided that I was going to rely on the students to be adults and do these problems and I would not grade them. I tested their understanding of graphing using calculus by assigning a graphing project that I graded prior to the exam. I am happy to report that *WebAssign* is currently working on adding graphing capabilities to their software!

As with most online homework systems, *WebAssign* uses randomly generated numbers in their problems. As most of us know, sometimes simply changing a number in a problem can make the problem more difficult or it can change the answer completely. In the homework after the section in which the students learned to differentiate e^x they decided to ask the students to find the derivative of e^{ax}, where a was an integer. This problem is not difficult, but the textbook had not yet introduced the chain rule, and most students wouldn't recognize e^a as a constant factor. So while randomizing the problems is good, they need to be careful to not create a question containing a concept that has not yet been covered in the textbook.

Another situation arose when one of my students was given a rational function with quadratics in both the numerator and denominator, and asked to find all asymptotes. The students were given one box to fill in for the horizontal asymptote and two boxes for the vertical asymptote(s). One student's particular randomization resulted in one vertical asymptote and one removable discontinuity. Yet *WebAssign* had two boxes for vertical asymptotes so the student kept getting the problem counted wrong. The student had graphed the function on his calculator so he knew that there was only one vertical asymptote. I told the student if he could *explain* to me why the function had only one vertical asymptote, I would give him the points back on his online assignment. I am unhappy to report that he did not earn those points for that problem.

Another issue that came up was that sometimes *WebAssign* wanted exact answers and other times, they wanted decimal answers. They have programmed an error tolerance of ±1%, but there were times when students would need to put in the

exact answer and it would count a decimal answer out to 4 places incorrectly. They are aware of this issue — I mentioned to them that they need to be very explicit in their directions for a problem so a student knows whether to give an exact answer or a decimal answer. Personally, I always want exact answers as I don't like having to grab a calculator while I am grading.



A multiple choice problem in WebAssign.

Some issues were not related to mathematics. For example, some students had trouble with certain browsers interacting with *WebAssign*. The support people suggested that we use Mozilla *Firefox* as it seems to be the most stable browser to use with their system. On questions that required the students to enter an algebraic expression, *WebAssign* was using *Math Palette*. *Math Palette* is a third-party product and sometimes seemed to cause problems for some students. *WebAssign* is developing their own tool for entering algebraic expressions.

At this point, you might think that I don't like *WebAssign*, but it does have many advantages. This online homework system can be used by both Mac and PC users — I have previously used a system that only worked on PCs. The gradebook is wonderful and very flexible. You can use a point system or a weighted average to calculate grades. You can put in paper assignments or exams by hand or import a spreadsheet. There a lot of settings that can be changed, such as the number of attempts a student has for each problem. (The default setting is five attempts and I think that seemed to be a good number.) You can set the due date and the time when each assignment is due.

I learned a very valuable lesson regarding this last point. I had each assignment due at midnight on the due date. The result was that I had several students sending me questions via email in the evenings. I did answer these emails because I had set the due date at midnight and am aware that students generally procrastinate, but next time I will have the assignments due during the day. On derivative problems, *WebAssign* accepts both the unsimplified answer and the simplified answer. At first, students were very excited that they didn't have to simplify their derivatives, but then they realized that they had to type their answers in very carefully so as to not have misplaced parentheses. This was actually a good exercise for them in orders of operations.

The biggest benefit was that most of my students actually *did their homework*. I truly felt that the students completing Calculus I were much stronger calculus students because they were forced to do homework (despite the fact that it was only 5% of their grade). I have increased the value of the homework to 7% of their grade for Fall 2008.

When the students completed evaluations for the course, I asked them to comment on the use of *WebAssign*. There were some complaints. For example, some students found it 'a real pain' to enter their answers online. One student commented that *WebAssign* 'did not care how we got the answer,' and complained that his methods 'were not accepted on tests.' I suspect that this means he was using a calculator to do his homework. Others remarked that the program online marked their answers right or wrong, without giving explanations or comments. That is my job as teacher, of course, and I encouraged students to use email when they needed my help. In fact, I think that there was more student/teacher interaction that semester than in previous semesters when I didn't collect or grade homework.

I feel strongly that online homework can be a good tool for Calculus I. I felt it created a different atmosphere in my classroom: students were talking to each other about calculus problems and helping each other figure them out. I will definitely use this program again when I teach Calculus I. In fact, all of my colleagues are currently using the program for Calculus I and some are using it for Calculus II.

Sharon Vestal is an Assistant Professor at South Dakota State University. She is an Enhanced WebAssign Instructor Trainer for Cengage Learning.

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Employment Opportunities

ALABAMA

Spring Hill College
Spring Hill College seeks applications for a tenure track position in Mathematics beginning Fall 2009. Position rank: Assistant or Associate Professor, depending on qualifications. Ph.D. in the mathematical sciences is required. Demonstrated excellence in teaching and potential departmental leadership qualities highly desirable. A strong commitment to teaching is required; candidates will be expected to teach a full range of courses from Basic Algebra to upper division courses required for a bachelor's degree in mathematics. Interest in pursuing undergraduate research experiences is also strongly encouraged. Position is open until filled.

Send letter of application, vita, statements on teaching and research, unofficial academic transcripts and three letters of reference to Dr. Charles Cheney, Dept. of Mathematics, Spring Hill College, 4000 Dauphin St., Mobile AL 36608, or mathematics@shc.edu Spring Hill College is a Jesuit, Catholic liberal arts college dedicated to quality teaching. Equal Opportunity Employer.

CONNECTICUT

Fairfield University
Assistant Professor
Department of Mathematics and Computer Science
The Department of Mathematics and Computer Science at Fairfield University invites applications for one tenure track position in mathematics, at the rank of assistant professor, to begin in September 2009. We seek a highly qualified candidate with a commitment to and demonstrated excellence in teaching, and strong evidence of research potential. A doctorate in mathematics is required. The teaching load is 3 courses/9 credit hours per semester and consists primarily of courses at the undergraduate level. The successful candidate will be expected to teach a wide variety of courses from elementary calculus and statistics to graduate level courses; in particular, Fairfield University's core curriculum includes two semesters of mathematics for all undergraduates.

Fairfield University, the Jesuit University of Southern New England, is a comprehensive university with about 3,200 undergraduates and a strong emphasis on liberal arts education. The department has an active faculty of 14 full-time tenured or tenure track members. We offer a BS and an MS in mathematics, as well as a BS in computer science. The MS program is an evening program and attracts students from various walks of life secondary school teachers, eventual Ph.D. candidates, and people working in industry, among others.

Fairfield offers competitive salaries and compensation benefits. The picturesque campus is located on Long Island Sound in southwestern Connecticut, about 50 miles from New York City. Fairfield is an Affirmative Action/Equal Opportunity Employer. For more information see the department web page at http://www.fairfield.edu/macs_index.html

Applicants should send a letter of application, a curriculum vitae, teaching and research statements, and three letters of recommendation commenting on the applicant's experience and promise as a teacher and scholar, to Matt Coleman, Chair of the Department of Mathematics and Computer Science, Fairfield University, 1073 N. Benson Rd., Fairfield CT 06824-5195. Full consideration will be given to complete interviewing at the Joint Mathematics Meetings in Washington DC, January 5-8, 2009. Please let us know if you will be attending.

MARYLAND

MONTGOMERY COLLEGE
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Montgomery College, one of Maryland's oldest community colleges, is a multi-campus institution located in Montgomery County, Maryland.

Montgomery College is seeking a full-time Mathematics faculty member for the Rockville Campus. Assignment begins August 2009. For more details and to apply online, please visit: https://jobs.montgomerycollege.edu

Online applications must be received by 12 noon, Monday, December 8, 2008.

Mathematics Faculty – Position #2224– Rockville Campus

Required Qualifications:
- Master's or Ph.D. in Mathematics, Mathematics Education, or a strongly related field. Degree must be earned by July 1, 2009.
- At least 18 semester hours of graduate level courses in mathematics

For more details and to apply online, please visit our website at: https://jobs.montgomerycollege.edu

Office of Human Resources – 240 567-5353.
Montgomery College is an academic institution that is committed to equal opportunity and fostering diversity among its student body, faculty, and staff. Tobacco Free Workplace

United States Naval Academy
The USNA Mathematics Department anticipates at least one tenure-track position (subject to approval and funding) at the Assistant Professor level to start in August 2009. See web site http://www.usna.edu/MathDept/website/employment.html for full information. Tel: 410-293-6701; Fax: 410-293-4883; Email: chm@usna.edu. The United States Naval Academy is an Affirmative Action/Equal Employment Opportunity Employer and provides reasonable accommodations to applicants with disabilities.

MASSACHUSETTS

Williams College
The Williams College Department of Mathematics and Statistics invites applications for one tenure track position in mathematics, beginning fall 2009, at the rank of assistant professor (in an exceptional case, a more advanced appointment may be considered). We are seeking a highly qualified candidate who has demonstrated excellence in teaching and research, and who will have a Ph.D. by the time of appointment.

Williams College is a private, coeducational, residential, highly selective liberal arts college with an undergraduate enrollment of approximately 2,000 students. The teaching load is two courses per 12-week semester and a winter term course every other January. In addition to excellence in teaching, an active and successful research program is expected.

Applicants are asked to supply a vita and have three letters of recommendation on teaching and research sent. Teaching and research statements are also welcome. Applications may be made on-line http://www.mathjobs.org/jobs). Alternately, application materials and letters of recommendations may be sent to Olga R. Beaver, Chair of the Hiring Committee, Department of Mathematics and Statistics, Williams College, Williamstown, MA 01267. Evaluation of applications will begin on or after November 15 and will continue until the position is filled. For more information on the Department of Mathematics and Statistics, please visit http://www.williams.edu/Mathematics.

Williams College is committed to building and supporting a diverse population of faculty, staff and students, to fostering a varied and inclusive curriculum, and to providing a welcoming intellectual environment for all. As an EEO/AA employer, Williams encourages applications from all backgrounds. To learn more about Williams College, please visit http://www.williams.edu.

MICHIGAN

Michigan Technological University
Department of Mathematical Sciences
Lecturer in Mathematical Sciences
Applications are invited for an ongoing teaching position in Mathematical Sciences. The successful candidate will teach a variety of courses at the introductory and intermediate levels, and will support the larger mission of the department by spearheading recruiting and outreach efforts. Initial appointment is anticipated at the Lecturer level, but exceptional candidates will be considered for appointment as Senior or Principal Lecturer. Tenure may not be earned in this position, but recent changes in the job classification, including improved job security and a clear promotion path, have made it possible to have a highly satisfying and rewarding career as a lecturer at Michigan Tech.

The Department of Mathematical Sciences offers BS, MS, and PhD programs. It also supports many other degree programs at Michigan Tech, which boasts a motivated and mathematically-savvy student body largely pursuing degrees in the sciences, engineering, and technology.

Required qualifications for the position are an MS in mathematics or a related field and a record of outstanding teaching at the university level. Desirable qualifications include a PhD in mathematics or a related field, experience in recruiting students into the math major, experience in teaching enrichment courses designed to attract middle and high school students to the study of mathematics, and the ability to teach differential equations, linear algebra, and/or discrete mathematics at the intermediate (i.e. sophomore or junior) level.

The position starts 17 August 2009. Review of applications will begin 15 January 2009; candidates applying by that date are assured full consideration. Interested candidates should send a vita, teaching statement, and three letters of recommendation to:

Search Committee
Lecturer Position
Department of Mathematical Sciences
Michigan Technological University
1400 Townsend Drive
Houghton, MI 49931-1295

The teaching statement should specifically address the required and desirable qualifications listed above.

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

MINNESOTA

Carleton College
The Carleton College Department of Mathematics has a tenure-track position in Mathematics at the Assistant Professor level, to begin September 1, 2009. Details, including application instructions, can be found at www.mathjobs.org and the College website www.carleton.edu/campus/doc. Carleton is an affirmative action/equal opportunity employer. We are committed to developing our faculty to better reflect the diversity of our student body and American society. Women and members of minority groups are strongly encouraged to apply. Review of applications will begin December 1, 2008, and continue until the position is filled.

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.

VIRGINIA

National Council of Teachers of Mathematics
Executive Director
The National Council of Teachers of Mathematics (NCTM), a nonprofit membership association in Reston, Virginia, is dedicated to improving math-

ematics teaching and learning from prekindergarten through grade 12.

NCTM is conducting a search for an Executive Director who is a proven visionary leader in mathematics education and who will provide strategic direction for its members, staff and mathematics education. The Executive Director serves as the chief staff officer and reports to the President and Board of Directors. He or she is responsible for executing the policies and strategic plans of the association with a $16 million budget, 100,000 members, and 100 employees.

A candidate should be a strong, inspiring leader, with demonstrated management skills, business acumen, and experience working with volunteers in a professional organization. A masters or doctorate degree in mathematics education or a related field is required.

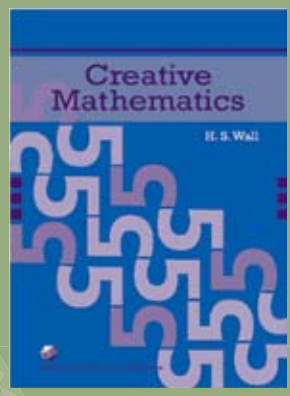
If you have a passion for mathematics education and can offer vision, leadership, and strategic direction for NCTM's members and for mathematics education, please see the position announcement on our Web site (www.nctm.org) http://and e-mail your résumé to HR Advantage at tina@hradvantageinc.com. NCTM is an equal opportunity employer.

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.

Mathematical Association of America Presents

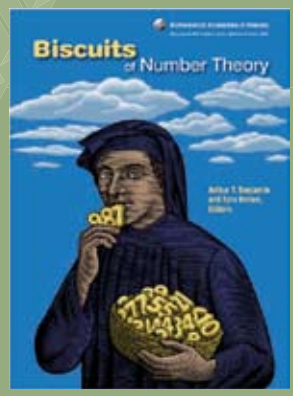
Creative Mathematics by H. S. Wall



Professor H.S. Wall wrote *Creative Mathematics* with the intention of leading students to develop their mathematical abilities, to help them learn the art of mathematics, and to teach them to create mathematical ideas. *Creative Mathematics*, according to Wall, "is not a compendium of mathematical facts and inventions to be read over as a connoisseur of art looks over paintings." It is, instead, a sketchbook in which readers try their hands at mathematical discovery. The book is self contained, and assumes little formal mathematical background on the part of the reader. Wall is earnest about developing mathematical creativity and independence in students. In less than two hundred pages, he takes the reader on a stimulating tour starting with numbers, and then moving on to simple graphs, the integral, simple surfaces, successive approximations, linear spaces of simple graphs, and concluding with mechanical systems. The student who has worked through *Creative Mathematics* will come away with heightened mathematical maturity.

Series: Classroom Resource Materials *Catalog Code: CRMA*
216 pp., Hardbound, 2009, *ISBN 9780-88385-750-2* *List: $52.95* *Member Price: $42.50*

Biscuits of Number Theory by Arthur Benjamin and Ezra Brown, editors



In *Biscuits of Number Theory*, the editors have chosen articles that are exceptionally well written and that can be appreciated by anyone who has taken (or is taking) a first course in number theory. This book could be used as a textbook supplement for a number theory course, especially one that requires students to write papers or do outside reading.

The collection is divided into seven chapters: Arithmetic, Primes, Irrationality, Sums of Squares and Polygonal Numbers, Fibonacci Numbers, Number Theoretic Functions, and Elliptic Curves, Cubes, and Fermat's Last Theorem. As with any anthology, you don't have to read the Biscuits in order. Dip into them anywhere: pick something from the Table of Contents that strikes your fancy, and have at it. If the end of an article leaves you wondering what happens next, then by all means dive in and do some research. You just might discover something new!

Series: Dolciani *Catalog Code: DOL-34*
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