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FOCUS

Volume 24 Issue 3

Inside

On the cover: A mathematical visualization that will be appearing soon at The Wolfram Functions Site at http://functions.wolfram.com *(see article on page 6 for the details). Created by Michael Trott with Mathematica.*

FOCUS Deadlines

	October	November	December
Editorial Copy		September 16	October 15
Display Ads	August 20	September 24	October 29
Employment Ads	August 13	September 10	October 15

MAA's Professional Enhancement Program (PREP) Funded by NSF

By Michael Pearson

This summer the MAA is offering a variety of workshops that will allow you to learn new mathematics, make new friends, and even find some time to relax and recharge your batteries before another academic year begins. Workshops for 2004 include programs focusing on interdisciplinary topics (including two on mathematics and biology), mathematical enrichment, and innovative curricula and pedagogical issues. You may choose to learn more about *Nifty Applications in Discrete Mathematics* or *Geometric Combinatorics*. There is even an on-line workshop, *Exploring Abstract Algebra using Computer Software*, for those who prefer to stay close to home. Whatever strikes your fancy, register soon to reserve your space.

PREP has been funded by the NSF Division of Undergraduate Education since 2001 and was recently awarded funding for 2004 through 2008. NSF-DUE funding also supports workshops in the MAA's Supporting Assessment in Undergraduate Mathematics (SAUM) and Preparing Mathematicians to Educate Teachers (PMET) programs which are offered under the PREP umbrella.

PREP workshops have three components: a preparatory component, an intensive component, and follow-up components that may include sessions at national meetings and electronic communication between participants and workshop leaders. All workshops are "hands-on" and offer participants an opportunity to work with colleagues to explore new ideas while establishing relationships for long-term professional support. Although most of the programs in PREP are for faculty in the mathematical sciences, those from other disciplines are welcome and some programs may specifically encourage communication among mathematics faculty and those from other disciplines.

Ten PREP workshops, eight PMET workshops, and the first session of a three-session SAUM workshop are scheduled during summer 2004. While there is a modest registration fee for most workshops, PREP covers the cost of materials, food, and lodging for on-site programs.

PMET workshops focus on teaching mathematics courses taken by prospective teachers at the elementary, middle, or secondary level. Participants observe demonstration classes and learn about the mathematical-thinking processes of students preparing for teaching careers. Participants will share ideas and learn more about appropriate mathematical content as well as ways of teaching preservice teachers more effectively.

A PREP 2004 brochure has been sent to all MAA members. Additional information and applications can be found at the PREP website, http://www.maa.org/prep, as well as on the program websites for PMET (http://www.maa.org/pmet) and SAUM (http://www.maa.org/saum). See also pages 23 and 24 of this issue.

SAUM

The objective of SAUM is to support faculty members and departments in efforts to assess student learning. The latest scheduled three-session workshop, *Assessing the Undergraduate Program in Mathematics*, is full as of this writing. We hope to schedule another workshop soon, and will post information on both the PREP and SAUM websites.

Undergraduate Research at the Phoenix Meeting

Undergraduate students and activities pertaining to research by undergraduates have become a significant component of the Joint Meetings. The Phoenix meeting included the following sessions related to undergraduate research.

Undergraduate Student Poster Session (see pages 8-9).

SIAM Minisymposium on Applied and Computational Mathematics: Research for and by Undergraduates.

AMS-MAA-SIAM Special Session on Research in Mathematics by Undergraduates (three sessions).

MAA minicourse on "Getting Students Involved in Undergraduate Research."

MAA Session on Initiating and Sustaining Undergraduate Research Projects and Programs.

Morgan Prize lectures by winner Melanie Wood and honorable mention recipient Karen Yeats.

In addition, a number of undergraduate students presented their research in the contributed papers sessions.

Note From the Editor

The Joint Mathematics Meetings bring together several thousand mathematicians every year. Even so, those who attend are a small fraction of the total membership of the MAA. In this issue, we have included quite a few articles, short notes, and photos from the meeting. (They fill about half of this issue.) We hope these articles are interesting in themselves in addition to giving readers a glimpse of what goes on at the national meetings. And we hope the many photographs will be interesting!

Mathematical Experiences in Business, Industry, and Government

Phil Gustafson

Applications of mathematics to projects in business, industry and government (BIG) offers a wealth of exciting problems for mathematicians. A wonderful sampling of BIG topics was presented at the MAA contributed paper session entitled "Mathematics Experiences in Business, Industry, and Government," during the Joint MAA-AMS meetings in Phoenix. This article discusses highlights of the BIG projects presented at the session, including modeling material stress in miniaturization; traffic and transportation; metrics for hiring systems; 3D photography; group theory in radar coding; consulting as an academic in BIG; hedge fund mathematics; externship courses; and life in a Silicon Valley start-up company. This paper session was sponsored by the Business, Industry, and Government Special Interest Group of the MAA (BIG SIGMAA), and was organized by Phil Gustafson of Mesa State College and Michael Monticino of the University of North Texas.

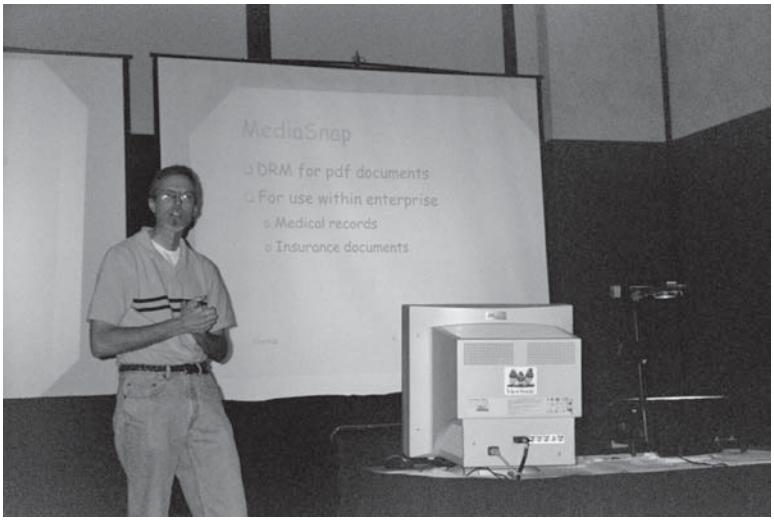
Ranjan Bhaduri

While at Motorola, Stan Russell was confronted with the challenges of miniaturization in electronic packaging, where many types of materials are in use. This motivates reexamination of a material's response to mechanical loading, e.g., its stress-strain (deformation) curve (also known as Hooke's Law in the special case of linear elastic materials). It becomes necessary to "stretch" Hooke's Law to account for these more complex nonlinear materials where micro/macro interactions become more important as devices become ever smaller. Based on theoretical results from nonlinear dynamics (e.g., Hartman-Grobman stability and Hopf bifurcation theorems), an empirical approach has been taken. Russell teamed with Frank Attanucci from Scottsdale Community College, whose tools of computer technology such as animation are being explored to enhance understanding of both the mathematics and the material systems under study. He also noted that modeling and simulation studies in materials science are becoming increasingly important and provide a valuable opportunity for involvement by mathematicians.

Donald Sokol spoke on mathematical models in transportation planning and traffic operations. Modeling daily travel began in earnest after the Federal Highway Act of 1914, with many early mathematical models applied to traffic operations. These were expanded to forecasting expected increases in travel and vehicular traffic. Mathematical modeling of modal activity, including freight-way routing, mass transit and pedestrian movements, and rail, sea and air transport, soon followed. The need to better estimate the economic return on investments in transportation improvements added another dimension to the use of models in transport planning and traffic operations. Although many of the first models used were of the self-statistical techniques, it was not long before mathematicians joined with other professionals to create innovative tools to better simulate the daily movements of people and goods over the various modes of travel. Sometimes these tools were used in a step-wise fashion to produce the hoped for result; at other times individual models of natural phenomena were integrated with statistical techniques in a unified representation of daily travel.

Tyge Rugenstein of the U.S. Military Academy and colleague Randy White developed and validated a metric for the hiring of fee-based practitioners for the United States Military Entrance Processing Command. The existing point system did not have a documented historical or theoretical basis and the results were considered suspect by both the medical staff and administrators. In order to establish a justifiable point system, the system had to accurately reflect real-world service times of the medical tasks completed at the Military Entrance Processing Stations (MEPS). The average time for completing each medical task was collected using multiple formats; a survey of all 65 MEPS, detailed timing sheets sent to 10 representative MEPS, and personal visits to 4 MEPS. The required time to complete a physical examination of a male less than 40 years of age (the most common task) was then used as a base unit. From this measurement, all other medical tasks were normalized to establish a new point system with 1 point equaling 15 minutes. Finally, simulation was used to compare results under the new system versus the old system. The new point system was shown to reduce the number of doctors required in approximately one-half of the tests, yet still allowing all tasks to be completed within the required time standard.

Nathan Cahill of Kodak spoke on designing a robust range imaging system. Image-capture projects our three-dimensional perception of the world onto a two-dimensional plane, resulting in the loss of range or depth information. Scannerless range imaging (SRI) systems, originally developed at Sandia National Laboratories, comprise an amplitude-modulated light source that illuminates the scene, a photointensifier that amplifies the reflected illumination signal, and a sensor that captures the amplified reflected signal. The emitted signal is reflected from a scene object, and it returns to the camera incorporating a phase offset related to the range of the object from the camera. Kodak scientists were able to significantly modify and improve the SRI system. By modeling the emitted signal and the response of the photo-intensifier, the code value at each pixel in a captured image can be expressed as a translated and scaled version of the cosine of the phase offset. This phase offset is extracted by collecting at least three images, and then by solving a linear system of equations. Subsequent image processing is then employed to compensate for artifacts that may arise due to phase ambiguities. Modeling, linear regression, Fourier analysis, simulation, and mathematical morphology combined to enable the creation of this range-imaging system.



Mark Stamp

Greg Coxson of Lockheed Martin Maritime Systems and Sensors spoke on a practical and simple group-theory application in radar coding. Radar-pulse compression codes are often selected for low autocorrelation peak-sidelobe level, or PSL. For binary codes, the optimal value of 1 is achieved by Barker Codes, but there are very few of these codes and none of odd length above 13. A useful observation about binary codes is that there exist three operations that preserve PSL, and they generate a simple group under composition. It turns out that there is a degeneracy in actions of this group on the Barker Codes of odd length. This can be used to uncover a common symmetry in these codes, and to define a superset of Barker codes of odd length. The superset can be exploited for searching for low-PSL codes. Though it isn't guaranteed to include the optimal codes in every case, relatively good codes can be found by searching a space of size $2^{(n-1)/2}$ rather than 2^n for any odd length n.

Michael Monticino of the University of North Texas outlined several consulting projects in his talk, "A Leg in Both Worlds: Consulting in Academics." One project involved developing models for forecasting the amount of cash needed in each branch each day for a major check cashing company. Too little cash in a branch can result in lost business, while too much cash results in higher than necessary interest charges as well as theft risk. The forecasting model needed to account for day-of-the-week, seasonal and holiday patterns, and special check cashing patterns around the times government checks are issued. The talk discussed both mathematical details of developing the model and non-technical aspects of the project. For instance, an important part of the work was effectively communicating an intuitive understanding of how the forecasting model worked to employees of the company. Finally, the talk described how consulting projects can be used to enliven classroom teaching and academic research programs.

Rick Cleary of Bentley College presented examples of consulting problems he has encountered, in which the solution depended on using basic statistical concepts rather than detailed data analysis. One specific example involved a problem in which a client wanted to determine if two population means were significantly different, in a case where the sample sizes and sample means were known but the original data and standard deviations were lost. Using the structure of the data, reasonable "best case" and "worst case" estimates of the missing standard deviations could be made. Rick also encouraged mathematicians to seek consulting opportunities in business and stressed that subject area knowledge is not always important.

Ken Levasseur of the University of Massachusetts at Lowell described an industrial externship that he used to develop parts of a new course in applied mathematics for students in a biotechnology doctoral program in the UMass system. The externship at Formatech (Andover, MA) was arranged through the Mathematics Applications Shaping Tomorrow program at Northern Essex Community College. Based on interviews of staff scientists at Formatech, Ken put the topics of linear regression and nonlinear curve fitting into the context of two stages in the process testing of drug formulizations. The course was offered in the fall of 2003 and preliminary indications are that students gained a deeper understanding of linear regression and their attitudes towards mathematics appeared to change for the better.

Ranjan Bhaduri of Northwater Capital Management gave examples of applied math problems that arise in the hedge funds arena. An introduction to hedge funds was given, and areas of mathematics that are applicable to the hedge fund arena were furnished (randomness, non-normal distributions, game theory, modeling, statistical metrics, and financial mathematics). Hedge-fund returns are typically non-normal, so skew, kurtosis, and higher moments come into play. The limitations of the Sharpe Ratio were discussed. Properties of the Omega function —a new metric invented by Canadian mathematician Bill Shadwick—were explored. Interesting research topics in the hedge fund arena were provided in the hopes that more mathematicians will study this area.

Mark Stamp of San Jose State University discussed his experiences with a small Silicon Valley start-up company, which worked to develop a digital rights management (DRM) product. One area of interest was "diverse" software, in which multiple instances of a piece of software were created so that each is functionally the same but whose code is different. Thus, if someone reverse engineers the software and breaks one instance, they have not necessarily broken all of the instances. There is an obvious parallel with genetic diversity of biological systems, and currently there is a lot of research on this topic as "diverse" software may help reduce the effects of computer viruses.

In this article we have seen many exciting applications of mathematics to projects in business, industry, and government. In a variety of settings, from industrial to financial, mathematics is a key component to many important projects in the world around us. Who uses math? The answer includes many of the mathematicians, scientists and engineers whose projects and products help improve the quality of our everyday lives.

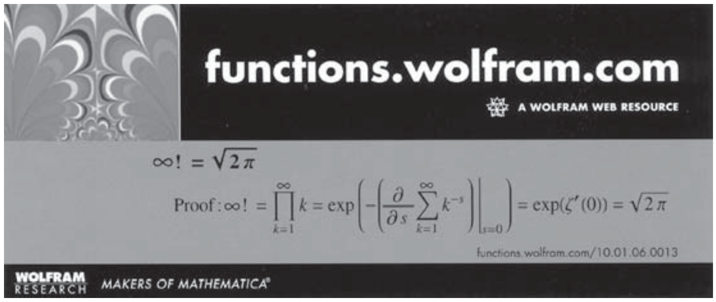
Acknowledgement: The author gratefully appreciates the input provided by the speakers for the content appearing in this article, and for their participation in the paper session.

Phil Gustafson is Associate Professor of Mathematics at Mesa State College in Grand Junction, CO, and is Vice Chair for Programs for BIG SIGMAA.

Correction

The January issue of FOCUS listed the Indiana Section Meeting as happening at Goshen College. The actual location for the April 2-3, 2004 meeting is Indiana State University, Terre Haute, IN.

Wolfram Research Announces New Functions Site



To promote their new functions site, Wolfram Research created a set of function stickers to be distributed at their exhibit booth. This was one of them.

At the Phoenix Joint Meetings, Wolfram Research, makers of *Mathematica* software, announced a new web site collecting information and images of a huge number of mathematical functions. The *Wolfram Functions Site* at http://functions.wolfram.com is a high-tech version of the traditional handbooks and tables of mathematical functions. Developed by Oleg Marichev and Michael Trott, the site gives access to a vast amount of information, including new visualizations of functions and even a "function of the day" feature.

For an example, we looked up the Airy *Ai* function. The site provided the following subtopics: primary definition, specific values, general characteristics, series representations, integral representations, differential equations, transformations, identities, complex characteristics, differentiation, integration, integral transforms, representation through more general functions, representations through equivalent functions, zeros, theorems, and history. A separate section lists visualizations of functions and constants (mostly, at press time, of the elementary functions).

Some of the formulas on the site seem to be new results. There is a lot of very rich information here, particularly on "special functions." The site has the ambition of becoming a resource for the whole mathematical community, and in that spirit they solicit contributions of various kinds. In particular, they ask for "interesting examples of how these functions have been put to practical use. Citations to scientific works incorporating or relying on these functions will add historical perspective to their value."

Wolfram's other well-known web site, *MathWorld*, is said to be "the world's most popular math web site." Found at http://mathworld.wolfram.com, its goal is to serve as a kind of encyclopedia of mathematical knowledge. Both sites are definitely worth a visit.

Zeros of the Generalized Zeta Function

The zeros of the generalized zeta function $\zeta(z,a) = \sum_{k=0}^{\infty} (a+k)^{-z}$ over the complex $z = x + iy$-plane as a function of a. The thick horizontal gray lines are along the critical line $z = 1/2 + it$. The thin gray line is along the imaginary z-axis. Through the functional equation $(2^z - 1)\zeta(z,1) = \zeta(z,1/2)$, the zeros of the Riemann zeta function $\zeta(z) = \zeta(z,1)$ either map into themselves or into integer multiples of $2i\pi/\ln(2)$ as a varies from 1 to 1/2.

From a forthcoming addition to The Wolfram Functions Site at http://functions.wolfram.com *Created by Michael Trott with Mathematica.*

Joint Mathematics Meetings—Phoenix, January 2004

The 2004 Joint Mathematics Meetings were held in Phoenix, Arizona, on January 7 to 10. More than 4000 participants attended the meeting. Most of the meeting sessions were held at the Phoenix Civic Plaza. From the plenary sessions to the many special sessions, there were talks for every interest. As always, a huge exhibit hall had displays from publishers and others. The other half of the exhibit hall held the Mathematics Employment Center, always a major activity at the meeting. This issue of FOCUS includes several articles, long and short, about the meeting and what went on there; on pages 15–18, you will find a collection of photographs from the meeting.

Things We Learned at the Joint Meetings

Contributed by Members of the FOCUS Editorial Board

There exist people for whom the Banach-Taski Paradox is not a paradox! Pat Allaire explained that she needs to work to convince some of her students that when a plane figure is cut up into pieces, then the pieces are moved around and reassembled, the area *does not change.*

The classification of the finite simple groups was a theorem in the 1980s, then it wasn't a theorem, and now it seems to be a theorem again. The proof of the missing piece, according to Michael Aschbacher in his plenary talk, will appear in two books forthcoming from the AMS, adding 1200 pages to the already large number of pages needed for the proof.

You can load a die, but you cannot bias a coin. Ann Watkins told us, in her talk on "Fallacies in Elementary Statistics," that adding weight to one side or another of a coin does not change the probability of its landing heads or tails when it is tossed.

You can never be too rich, too thin, or know too much mathematics. So says Ann Watkins, quoting David Moore. Some of us don't agree with the first two.

One of the Project NExT fellows teaches a course on Star Trek. Sounds like fun!

It is possible to characterize different types of leukemias by considering genetic types as vectors in an approximately 30,000-dimensional vector space and then, with a clustering algortihm, identifying a separating hyperplane that distinguishes genetic types. This can also be used to predict promising therapies. This was part of Eric Lander's Gibbs Lecture on "Biology as Information."

Both the *College Mathematics Journal* and *Math Horizons* have new editors. Lowell Beinecke has taken over *CMJ* as of the January issue, and Art Benjamin and Jennifer Quinn will be editing *Math Horizons.*

Interesting New Things are being Planned for MathDL. The MAA's *Mathematics Digital Library* will soon be adding a database with book information and reviews, online mathematics books, and other neat stuff.

Six is even, but it's also odd. Well no, we didn't actually learn that, but it was the central issue in a fascinating video of young children discussing mathematics shown by Hyman Bass in his lecture on "Mathematics, Mathematicians, and Mathematics Education."

$$\frac{1}{\sin\frac{\pi}{7}} = \frac{1}{\sin\frac{2\pi}{7}} + \frac{1}{\sin\frac{3\pi}{7}}$$

The topic for Math Awareness Month 2004 is The Mathematics of Networks (It's a Small World). Expect more details as April approaches, or check the MAM web site at http://mathforum.org/mam/

There will be "Rudin Books" that are not by Walter Rudin. McGraw Hill announced at the Joint Meetings that they will be creating a new series of mathematics textbooks called, in honor of one of their most famous authors, *The Walter Rudin Student Series in Advanced Mathematics.* The editor-in-chief of the new series will be Steven G. Krantz of Washington University in St. Louis.

You Can Sponsor a Project NExT Fellow. In its early years, Project NExT was entirely funded by grants, mostly from the Exxon-Mobil Foundation. Those grants are now being phased out, and NExT needs to raise money to fund new Fellows. Funding one NExT Fellow for one year costs $2,500. MAA Sections and other organizations are being particularly encouraged to take on the commitment to sponsor fellows, if possible for several years. If you're feeling even more generous than that, a few million dollars would be enough to endow the whole program so that it can be run permanently (talk to Lisa Kolbe at the MAA headquarters).

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The Undergraduate Student Poster Session in Phoenix

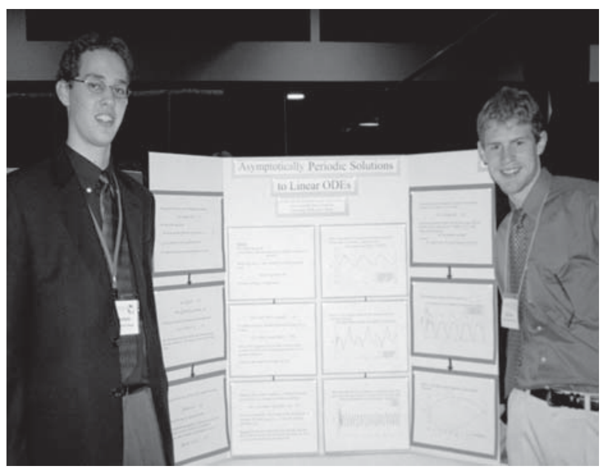
By Mario Martelli

With 110 teams from all over the country — an unprecedented number — the Undergraduate Student Poster Session increased its already well-established role in the Joint Meeting of the American Mathematical Society, the Mathematical Association of America, and the Association for Women in Mathematics. Thanks to the efforts of Jim Tattersall, Associate Secretary of the MAA, we were assigned half the Ballroom of the Phoenix Convention Center and we filled it up! Over 115 professional mathematicians participated in the evaluation of the posters and thirty-two $100 prizes were given to the posters that received the highest marks. As in past years the prize money came from the AMS, MAA, AWM, and CUR. This year, for the first time, and with welcomed generosity, we received a considerable contribution from the Educational Advancement Foundation.

Mario Martelli and Colin Adams together with the authors of the winning posters.

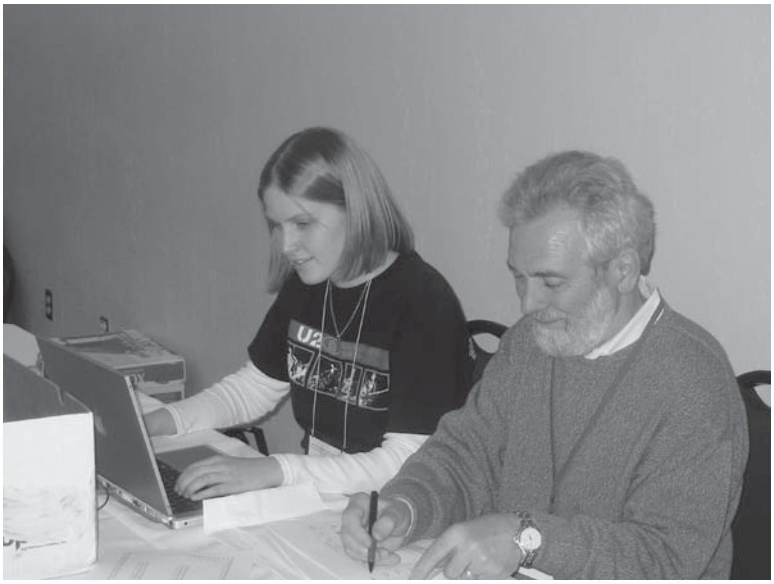
Before adding more details to this report, I want to reinforce in the minds of our students that they should be extremely proud of just being accepted as presenters. The recognition given by the judges is important, but the actual ranking is frequently affected by unpredictable and uncontrollable variations. First, let me mention that the points received ranged from 66 to 98. The prizes went to posters ranked between 84 and 98. However, even in this category there were sometimes significant differences between the evaluations of the three judges. For example, one poster received 35 (out of 35) from one judge, 34 from another judge, and 21 from a third judge. More variations were observed among posters that did not get a prize. The most surprising case was a poster that received 35 points from one judge, 24 from a second judge and 13 from a third judge! Opinions can be very different, even among experienced mathematicians. Therefore, I want all presenters to be convinced that the most important prize of the Undergraduate Student Poster Session is to have been recommended by their advisors and to have been accepted by the organizers.

David Marshall, Jessica Sidman, and Sarah Spence, veteran poster session presenters, were back as judges this year.



Aaron Arvey and David Nichols, both sophomores at Claremont McKenna College, with their poster on Period and Asymptotically Periodic Solutions of First Order ODEs.

This year, for the first time in its history, the Poster Session had three judges who had been poster presenters in the past: David Marshall, Jessica Sidman, and Sarah Spence. David presented a poster on *Stability and Attractivity for Discrete Dynamical Systems* at the January, 1994 Joint Mathematics Meeting (JMM) in Cincinnati. Jessica's poster on *Splitting Numbers* was presented at the 1997 JMM in San Diego. Sarah presented a poster on *A Study of Factoring and Cyclic Codes, Reed-Muller and Kerdock Codes* at the 1996 JMM in Orlando, and a poster on *Stratified Graphs and Distance Graphs* at the 1997 JMM in San Diego. David is now at the University of Texas, in Austin, Jessica is at Mount Holyoke College, and Sarah is at Olin College. Congratulations to all three and many thanks for their contributions to the success of this initiative.



Mario Martelli and Carolyn Staples tabulate the scores.

I am not going to list here all of the posters that received a prize. A complete list can be found online at http://www.maa.org/news/winningpostersJan04.html. I will simply mention the two posters that received the highest marks. The next poster after these two was three points away from their total. The two posters evaluated so favorably were:

Aparna Higgins, along with Colin Adams and Mario Martelli, announces the prize-winning posters.

A Conjecture on Homogeneous Ideals presented by Melissa Kraus of Cal Poly San Luis Obispo. Her advisor was Dr. Ben Richert from Cal Poly San Luis Obispo.

Subgraph Summability Number of a Graph presented by Josh Whitney from Arizona State University. His advisor was Dr. Sivaran Narayan from Central Michigan University.

Both projects were done at REU programs, at Cal Poly San Luis Obispo and at Central Michigan University.

I would like to extend special thanks to the group of six judges from Pepperdine University. I suspect that the entire department was at the Poster Session! I also want to thank all Project NExT fellows for the outstanding contribution to the success of the initiative. They came to my rescue with enthusiasm and dedication.

I want to recognize other people whose help was crucial and was greatly appreciated. Several members of CUSAC (Committee on Undergraduate Student Activities and Chapters), including Richard Neal, Chair of the Committee, came to help me with the non-trivial organizational details. My students Aaron Arvey, David Nicholls, and Carolyn Staples helped me in carrying four boxes of booklets (very heavy! No booklets were left after the Poster Session!) from my hotel room to the ballroom and in setting up the place before the presenters came. I want to thank Fernando Gouvêa for taking many pictures, Robin Hagan Aguiar and Donna Salter from the AMS-MAA registration for generously providing all materials needed by the students to set up their posters, and my secretary Patty Castro for typing the booklet and taking care of the printing. And I cannot forget Aparna Higgins who announced the winners with a booming voice from an unstable platform, and Colin Adams who brought the prize money.

It has been an incredible and exciting event! Some people said that a lot of merit is mine, but I firmly believe that most of the merit should go to the presenters and to their advisors. Dear friends, presenters, advisors, and judges, I hope to see you all at the Undergraduate Student Poster Session in Atlanta in January, 2005!

Mario Martelli teaches at Claremont McKenna College. He can be reached at mario.martelli@claremontmckenna.edu.

Joint Mathematics Meetings, January 2004 Report of the Secretary

By MAA Secretary Martha J. Siegel

As usual, this has been a busy fall in the MAA. We are happy to welcome Sharon Tryon, Director of Finance, to the staff, and on behalf of the officers, I want to thank Gene Darrell for all the help he has given us as Acting Director of Finance.

Lowell Beinecke now sits on the Board as Editor of the *College Mathematics Journal*. Woody Dudley, Lowell's predecessor at the *CMJ*, recently finished a term as the editor on the Executive Committee. Frank Farris, Editor of *Mathematics Magazine*, was elected by the Board to a two-year term to fill that position starting January 1, 2004.

After these meetings we will be saying goodbye to two of our Governors-at-Large, Jacqueline Giles, Governor-at-Large for Minorities, and Grace Orzech, Governor-at-Large for Canadians. I am pleased to announce that Nathaniel Dean and Jonathan Borwein will fill their positions.

For some on our Board of Governors, this will be their last formal meeting, though they remain on the Board until June 30, 2004. I thank them for all they have contributed to the MAA and to the Board. They are: Jasper Adams of the Texas Section, Ruth Berger of the Iowa Section, Connie Campbell of the Louisiana-Mississippi Section, Ralph Czerwinski of the Illinois Section, Jerrold Grossman of the Michigan Section, Robert Heal of the Intermountain Section, Michael Hvidsten of the North Central Section, Mario Martelli of the Southern California and Nevada Section, Elizabeth Mayfield of the MD-DC-VA Section, Marilyn Repsher of the Florida Section, and Kay Somers of the EPADEL Section. I remember greeting these governors for the first time and noting what a great group they were! They will be missed, for they participated in a meaningful way in all of our Board discussions. We consider them a great resource and will call on them for service on the national level.

Ann Watkins will continue on the Board as Former President, our First Vice-President, Carl Cowen will continue in a new role, and we express our thanks to Joe Gallian, Second Vice-President, who now steps down from the Board. We congratulate our new officers: President-Elect Carl Cowen, First Vice-President Barbara Faires, and Second Vice-President Jean Bee Chan.

The Board approved changes in the By-laws of the newly named Southern California-Nevada Section, and voted on the 2005 dues matrix. The Board also approved the new *Annie and John Selden Prize for Research in Undergraduate Mathematics Education*. The regulations for the award will be presented to the Board in the near future. In a small organization change, the Committee on Publications was merged with the Council on Publications and the Committee was dissolved. We welcome a new chair of the Council on Publications, Roger Nelsen of Lewis and Clark College (and *Proofs without Words* fame) and thank Jerry Alexanderson for his exemplary service in that position.

The Board voted that a Certificate of Appreciation be presented to Chancey Jones, of the College Board, for his many years of work on behalf of mathematics and his cooperation and leadership in dealing with the mutual concerns of the MAA and the College Board.

At the Business Meeting, members approved a change in the Bylaws of the Association specifying the responsibilities of the Treasurer and the Investment Committee. Please see MAA Online for the new Bylaws.

The Executive Committee approved our eighth new special interest group: the SIGMAA on Quantitative Literacy.

One of the most ambitious projects of the MAA now going into the implementation phase is the CUPM study of the undergraduate mathematics curriculum, led by chair Harriet Pollatsek. As soon as possible, you should make yourself aware of the committee's proposals and plan for the implementation of the recommendations, which have Board approval. The CUPM recommendations will be distributed to all mathematics departments.

Because of the complexity of the MAA website, we are giving Fernando Gouvêa the title of Editor of *FOCUS* and *FOCUS Online* (sometimes known as *FOL*), rather than of MAA Online, which refers to the full web site. *FOL* includes news, features, columns, book reviews, and the *Teaching and Learning* section. The change clarifies what Fernando does and acknowledges the fact that many different members of the MAA staff are responsible for material in other parts of the MAA web site.

Future meetings of the Association, approved by the Board of Governors are:

August 12-14, 2004 in Providence, RI
January 5-8, 2005 in Atlanta, GA
August 4-6, 2005 in Albuquerque, NM
January 12-15, 2006 in San Antonio, TX
August 10-12, 2006, in Knoxville, TN
January 4-7, 2007 in New Orleans, LA
August 3-5, 2007, in San Jose, CA
January 6-9, 2008 in San Diego, CA
July 31-August 2, 2008, in Madison, WI
January 7-10, 2009 in Washington, DC.
January 4-9, 2010, in San Francisco, CA
January 3-8, 2011, in New Orleans, LA

Mark your calendars! Planning is beginning for the 2015 meeting, which will mark the centennial of the Association.

We thank the MAA Program Committee for the Phoenix meetings (chair: Jeff Lagarias), the AMS-MAA Joint Program Committee, our Associate Secretary, Jim Tattersall, and Local Arrangements Chair, Bill Velez for a wonderful mathematical experience in Phoenix. Invited talks, short courses, contributed papers, panels, and the prize session (every student winner was female!) were stimulating and exciting. See you in Providence at MathFest!

Environmental Mathematics SIGMAA Activities: Off to a Running Start

By Ben Fusaro

Right after the Environmental Mathematics SIGMAA's business meeting on Thursday, we started off with a talk, *America's Low Energy IQ,* by the MAA's former Executive Director, Marcia Sward. She used the results of a national opinion survey to validate her title. Marcia then passed out her "after-lecture quiz," the very questionnaires that were used in the survey. The kindest way to report the results is to say that we didn't know as much about energy and its use as we thought we did.

That evening we had dinner at the Teeter House in Heritage Square — good food in a cozy, historical setting. After dessert, Frank Wattenberg of West Point gave us a talk based on the film *Apollo 13*. He had edited the film down to about 20 minutes of DVD drama, beginning with "Houston, we have a problem…" He then led the audience through a series of one-to-one correspondences between the challenges faced by Apollo–Houston and the environmental challenges we face on earth. Frank brought home the power in the metaphor "Spaceship Earth." He urged us to continue the important work of getting mathematics to assume its responsibilities in dealing with problems of the environment.

Arizona State University geologist Steve Semken holds an informal on-site seminar, using an extraordinary butte as a backdrop (and easel!). Photograph by Chris Allgyer of Mountain Empire Community Collge, VA.

Saturday afternoon Dr. Steve Semken, a geologist from Arizona State University, led 55 of us on a two-and-a-half-hour expedition. The target was a remnant of the magnificent Sonoran Desert, trapped in the Phoenix–Tempe metropolitan area. Our targets were the deep-red buttes of sandstone and conglomerate, riddled with small caves and alcoves, that tower above the desert floor. Steve told us about local desert geology in the context of place-based geoscience teaching methods. He encouraged us to consider the geosciences as a rich source of mathematical applications. Steve gave us a chance to take part in an inquiry-based field exercise much as ASU geology students do, and discuss ways that such field experiences might be used to teach basic mathematical principles.

The Environmental Mathematics SIGMAA has already begun to plan for the next two national meetings, this summer's MathFest in Providence and next January's Joint Meetings in Atlanta.

Plans for Providence include: a guided tour boat or ferry trip on the Narragansett Bay (the guide will be a mathwise fisheries expert); a guided bicycle tour around the head of Narragansett Bay; a free walking tour through Providence guided by Environmental Mathematician Barry Schiller of Rhode Island College; a speaker at our Business Meeting who will address the role of mathematics in facing environmental challenges; a dinner with a speaker on mathematics and the environment; free morning T'ai-chi if space can be found. Tentative plans for Atlanta include a speaker at our Business Meeting, dinner with a speaker on mathematics and the environment, and a bus trip and guided tour to the Botanical Garden. All are welcome to these activities, but members of our SIGMAA will get a discount on any charges and early notice of our plans.

Join our SIGMAA and get "early warning" of all our activities! Our Boulder MathFest walking tour and the Phoenix bus trip were quickly oversubscribed. Contact Ben Fusaro via email at fusaro@math.fsu.edu for more information.

Both Sides of the Table

By Randall J. Swift

The 51st Annual Mathematical Sciences Employment Center was held at the Joint Meetings in Phoenix, Arizona, January 7, 8, 9, and 10, 2004. The Mathematical Sciences Employment Center is an interviewing program for Ph.D.-level mathematicians seeking employment and for employers, mainly academic, who wish to conduct brief interviews with them.


Applicants pick up their folders at the Employment Center.

The Employment Center is a central feature of the Joint Meetings, especially if one is in the job market, or in a department that is hiring. Of the dozen Joint Meetings I have attended, I have spent many long hours in the Employment Center on both sides of the table.

In 1992, when I was looking for my first academic position, the Employment Center was called the Employment Register. At that time, the sole feature of the Employment Register was the computer-scheduled interview tables in which a program is run to match applicant requests with employers. The interviews are a brief ten minutes and are essentially just a first contact. My experience as an applicant with the computer-scheduled interview tables was positive, as it is what led to my position at Western Kentucky University. However, it was a difficult and trying, pressure-packed experience. Candidates struggle to make their best impressions in that short ten-minute time window. I was fortunate with my experience however, many candidates, especially during the early nineties, didn't do as well.

The anxiety of applicants in the Employment Register was compounded during the mathematics job crisis of the early to mid-nineties. As a result of the collapse of the Soviet Union, Tiananmen Square, and the difficult economic conditions of the early 1990s, there were often several hundred candidates for a given position. This crisis made the Employment Register an almost unbearable nightmare as applicants struggled and hoped for a chance to talk to a possible employer.

During this time, Western Kentucky University was hiring and since I regularly attend the Joint Meetings, I was asked to assist the department at its employment table. My first experience on the other side of the table occurred at the 1993 San Antonio meetings. This was during my first year of appointment. I was interviewing candidates for the type of position that I had only held for just a few months! Needless to say, all I could do was provide a little information about the department and what we were searching for.

That year was a very formative experience for me. I spent most of those meetings sitting next to my department head, James Porter, listening to him conduct interviews. His years of experience allowed him to patiently explain what the department was searching for while often asking telling questions of the candidates. Listening to him taught me a lot about interviewing candidates, but given my newness, I could also see just how nervous the candidates were. Indeed, only a few short months before, there I had sat. I promised myself that I would always try to make a candidate feel at ease.

In subsequent years, Western Kentucky continued to hire and I found myself again sitting at the other side of the table during the meetings. Each year, the experience remained difficult as I always was keenly aware that the applicants were under a lot of stress, a stress that increased as the job market continued to worsen.

The job crisis lasted from 1990 to about 1996 and prompted the AMS-MAA-SIAM Committee on Employment Opportunities to improve the Employment Register. During this time, the computer-scheduling program was upgraded, and in response to requests for longer interview-time segments, an alternative method of conducting interviews was developed.

The employer-scheduled interview tables in the Interview Center are reserved tables at which interviews with candidates can be conducted. These interviews can be longer in length and are often arranged in advance of the meetings. The Interview Center is usually a comfortable room offering coffee, aisle carpeting, tables, and chairs. The whole thing feels more relaxed than the computer-scheduled interviews.

Both the computer-scheduled and the employer-scheduled interviews are available now at the Joint Meetings. Some departments make use of both of these features, while others will only use one. The expanded choices have given employers and applicants more flexibility. Indeed, what is now called the Employment Center is a well-organized, vital part of the Joint Meetings and has many additional facets.

To participate in the Employment Center, both applicants and employers must register. Applicants who pre-register for the Employment Center will have their brief applicant résumé appear in the *Winter List of Applicants*. Employers that pre-register have their positions described in the *Winter List of Employers*. These publications are mailed out in advance to those who had completed advance registration. The list of applicants is one source that employers use to contact applicants for interviews.

The Employment Message Center provides individual folders for each registered applicant and employer. These folders give applicants and employers a convenient method of communicating. Candidates can contact employers to request an interview and employers can communicate with individuals that fit their position. The Employment Center also has a reference area which is stocked with college guides and books of advice about the academic job market.

The poor hiring conditions of the nineties are part of our past as a profession, but the effects of this hiring crisis can still be felt today. There is a generation of misplaced mathematicians, many of whom find themselves in positions they would not have accepted in better times. (The economic boom of the late nineties did allow some colleagues to pursue other opportunities. Many in the profession are now in new positions. I am now in my third year as a tenured member of the department of mathematics at California State Polytechnic University, Pomona.)

Cal Poly Pomona is a large polytechnic university with a strong engineering program. I am delighted to be a member of this department. Cal Poly Pomona's initial growth as a University occurred in the 1960s and until very recently the mathematics department consisted of primarily full professors nearing retirement age. This situation has been changing rapidly. Currently there are twelve regular members of the department who have been hired within the last four years. The growth of the university, retirements, and the effects of the California State University hiring freeze of the nineties have put Cal Poly behind in replacing its retiring faculty. The department has long-term plans to hire for the next five-plus years.

This is a rather exciting aspect of our department; within the next few years virtually the whole department will consist of new faculty. This brings a lot of energy and new ideas to the department and our future is bright. It is with these thoughts in mind that I agreed to serve on the department's search committee during my second year in the department.

Last year's hiring was almost a record number for the department. We brought out thirteen candidates to campus and successfully hired four new members. These four new colleagues are true gems and already are contributing to the department.

Two of these hires were initially contacted at the Interview Center at the Joint Meetings in Baltimore. Cal Poly Pomona's mathematics search committee has been using the employer-scheduled interview tables in recent years. We feel that for our approach to hiring this is a more effective method. However, our success in hiring comes at a price to the search committee. Last year in Baltimore only three members of the committee were at the Joint Meetings. The three of us spent the vast majority of our time conducting interviews. But the rewards made it worthwhile.

The employer-scheduled interview tables at the Employment Center.

I am chairing this year's department search committee and it has been a very interesting experience. The California state budget woes and the change in governors have led to a great deal of uncertainty. Our initial request of four positions has been reduced down to just one position. We have to make very strong arguments about hiring during such difficult economic times. However, our dean is very supportive and we have a clear need in the department.

With this goal, our search committee went to the Joint Meetings in Phoenix. Unlike the meetings in Baltimore, we had six of the seven members of the committee at the meetings. This did ease the burden of spending all of one's time at the table, but one committee member and I did end up staying there for the majority of the time. With this commitment and other meetings I had to attend, I did not make a single mathematics talk in Phoenix!

Why do I have this kind of commitment to hiring? As a professor of mathematics, I can contribute to the discipline in many ways, by excelling in teaching, by accomplishments in mathematics research, or by assisting with service. My view of our profession is that these three areas are not distinct. They are interconnected in a very natural way. I consider hiring a way to strengthen the teaching of our department and to vitalize its research. I strongly feel that hiring the very best people only improves my working environment. It is with this view that I chair this year's committee. My fellow committee members have been outstanding, devoting long hours to the tasks associated with our search.

The Employment Center at the Joint Meetings is our profession's vehicle for conducting interviews and screening candidates. It has its pluses and minuses, but overall it is effective. Having been on both sides of the table, from landing my first position to hiring outstanding colleagues, I am convinced that the Employment Center can be used successfully by both the applicant and the employer. As our profession continues to grow, the Employment Center will continue to be vital to serving the employment needs of our discipline.

Randall J. Swift is an associate professor of mathematics at California State Polytechnic University, Pomona. He is a coauthor of the MAA text A Course in Mathematical Modeling, *editor of* Stochastic Processes and Functional Analysis: Recent Advances *and has written forthcoming texts in Probability Theory and Differential Equations.*

Career Brochure Order Form

The new MAA career brochure *We Do Math!* highlights eleven profiles from *101 Careers in Mathematics*. These vignettes describe a variety of non-academic careers for which a background in the mathematical sciences is useful. Each of the jobs presented shows real people in real jobs.

The eight-panel brochure is 4” by 9” (folded) and can be mailed in a standard envelope or distributed in the classroom or at career fairs or recruiting events.

When students want to know how a mathematics degree can benefit them, be prepared to answer with *We Do Math!*

A Special Offer

Your school logo and/or contact information can be printed on the brochure

Schools ordering brochures in time have the option of including the school logo and/or contact information on the front of the brochure. PRE-ORDERS + LOGO (black or one-color version only) **must be received by MAA headquarters by March 12, 2004.**

Brochure Pricing

Copies of *We Do Math!* are available in bulk in multiples of 1000. If you add your institutional information on the brochure, there is a one-time set up fee of $150.00.

Quantity:____________ at $175/1000 = __________

Setup: $150.00

Total: __________

☐ **Yes!** I want to preorder brochures with my school logo and/or contact information on the brochure.

☐ I want to order brochures without my school logo on the front.

Questions?

Contact Chris Proesel
(202) 319-8469
cproesel@maa.org

We're looking for more career profiles. If you would like to contribute profiles featuring your students for possible use in future brochures, please contact us.

Contact Name	
School	
Phone Number	
Fax Number	
Email	


Joan Evans, Peter Lax, Jackie Giles, and Leonard Gillman.


Helaman Ferguson and Richard Guy at Ferguson's exhibit.

Andy Liu's acceptance speech in eight parts (of speech).


Clifford Stoll with his Giant-sized ACME Klein bottle.

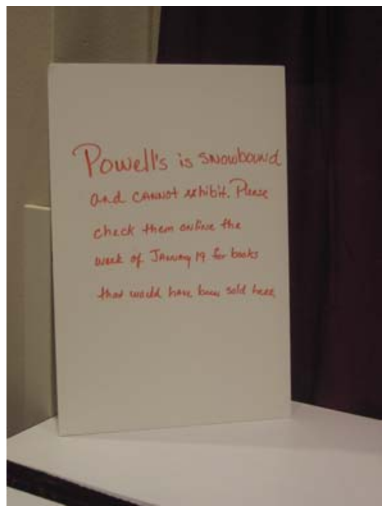

Bill Finkenkeller of Rice University at the Undergraduate Poster Session.


Jim Gandorf, MAA Director of Membership.


Ed Packel, new editor of the Anneli Lax New Mathematical Library.


Don Albers and Fernando Gouvêa.


MAA books exhibit



Powells didn't make it.


The main lecture hall.


MAA membership booth.


David Bressoud and Don Albers


The beards have it: Stacy Langton, Fernando Gouvêa, Ed Sandifer, and Leon Harkelroad


Jennifer Quinn and Art Benjamin, new editors of Math Horizons.


One of the tables at the AMS dinner.

A K Peters and Birkhauser booths.

Sun-Yung Alice Chang gives the Colloquium Lectures.


Benoit Mandelbrot and Don Albers.


Standing in line for email.


String Quartet plays "Commutator Music" at the MAA's Author Reception.

Project NExT booth.

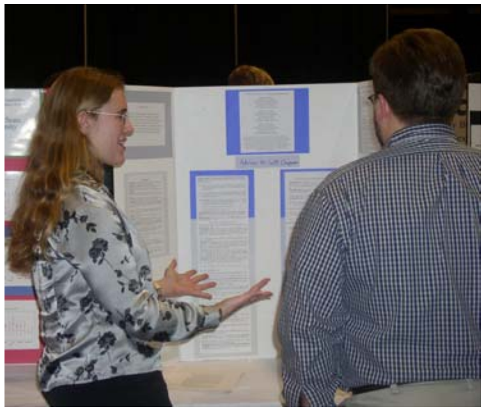
Ron Graham and Martha Siegel at the MAA Business Meeting.


Sharon Cutler Ross


NExT fellows give Chris Stevens a standing ovation.


Pat Kenschaft and Jackie Giles

Beverly Ruedi in funny hat, Carol Baxter in MAA shirt.



Melissa Banister explains her poster.

Melissa Banister, her advisor Scott Chapman and her prize.

Anita Solow

AMS book exhibit

Martha Siegel makes last minute changes.

Dan Kalman

Don Albers

Michael Pearson and careers flyer *(see page 14).*

Michael Aschbacher

Announcing a new series of books.

Roseann Brown

Bob Megginson

MAA Notes editorial board meeting.

Stephen Wolfram

Neil Sloane confesses that he is a "sequence addict."

John Ewing, Carl Cowen, and Bob Daverman cut the ribbon to open the exhibits.

William Barker

Blowing bubbles at one of the exhibits.

Stacy Mills of the University of Texas at Austin and her poster.

Benoit Mandelbrot, Don Albers, Robin Wilson, and Bruce Palka.

Ann Watkins explains some suspicious photos.

So You Want to Write a Pop-Math Book?

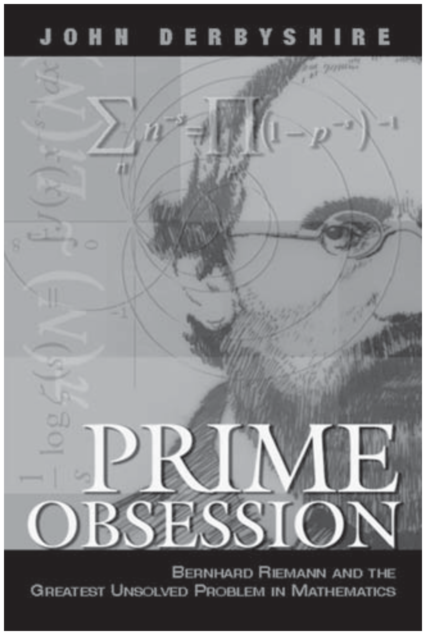
By John Derbyshire

In April 2002 I published a book called *Prime Obsession*, an account of the Riemann Hypothesis for not very mathematical readers. My book has been more successful than a book of that kind has any right to be, for which I am of course very grateful. The editor of FOCUS asked me to write down some notes about the making and selling of the book, and about the matter of pop-math books in general.

First, I should explain how I came to write a book of this kind. I am not a professional mathematician, nor even a teacher of mathematics (though I once, briefly, was that). I am a freelance writer, journalist, and web journalist. Before that, I was a computer programmer in the financial-services industry. I started out in life with the intention of becoming a mathematician, though, and attended University College, London, for three years, graduating with a bachelor's degree in math. At that time in England, at any rate at that college, there was no nonsense about majors and minors; we just did three straight years of unadulterated math. This got us to a pretty high level — much higher than that reached by a first-degree course in a present-day American university.

In the course of rising to those rarefied mathematical altitudes I gained an item of what, according to the Ancient Greeks, is the most precious type of knowledge: self-knowledge. I discovered that I was not very good at math. I discovered this by the oft-repeated experience of watching more gifted classmates "see through" a problem in five minutes of reflection, while I myself had to spend a weekend sweating over the same problem to get the same result. There were also some areas, particularly in algebra, where I simply "hit the wall" — where I found that, with the most diligent application I was capable of, I could not understand the material.

With this precious item of self-knowledge in hand, following graduation I did



the sensible thing and took up a nonmathematical career. I never lost my affection for math, though, nor my belief that it is the highest form of intellectual endeavor. My own love for the subject was unrequited — I loved math, but math didn't love me — yet it is a well-known peculiarity of human nature, illustrated for example by the career of the poet W. B. Yeats, that unrequited love can sometimes be the most enduring and inspiring kind. I continued to love math, to read math books and magazines, occasionally to work my way through a textbook, patiently completing all the exercises. (A math textbook, to my way of thinking, is useless if it doesn't have lots of exercises.) Since living in the U.S. I have kept up membership in both the MAA and the AMS, and sit at the breakfast table chuckling over math periodicals, to the bafflement of my wife, who is deeply unmathematical.

And so, in the summer of 2000, I happened to be reading Abe Shenitzer's excellent translation of the late Detlef Laugwitz's book on Bernhard Riemann. Just at this time, my literary agent was trying, without any success, to place a novel I had written. I like my agent, and wanted him to continue as my agent, so I thought I had better have a book proposal ready for him, for that inevitable day when he declared that he had done all he could do with the novel. It occurred to me that there was a book to be written about the Riemann Hypothesis, in which the math of the topic could be agreeably mixed with historical and biographical background material. I did some further reading, carried out some explorations on the Internet, and had dinner with Andrew Odlyzko, whose name kept turning up in my Internet browsing.

Andrew is now at the University of Minnesota, but at that time he was working for Bell Labs in New Jersey. I drove there from my home on Long Island, and we had dinner at an Italian restaurant near the labs. Andrew was a key player in some of the events related to the Riemann Hypothesis in the 1970s and 1980s, and maintains a keen interest in the topic. That's why I kept seeing his name on the Internet. He is also, I should add, something of a character. When you mention his name, people start to tell amusing, affectionate Odlyzko stories, along the lines of the apocrypha that often develop around colorful mathematical personalities — Paul Erdös and David Hilbert come to mind. At any rate, he was extremely patient and kind in the face of my, at that point, not very well informed inquiries. It was that dinner with Andrew that really got my book project off the ground. I went home with a sheaf of notes and, in less than a week, had a 20-page proposal ready.

My literary agent was at first skeptical. I introduced him to the idea over lunch in Manhattan one day.

"Howard," I announced, "I'd like to write a book about a great unsolved mathematical problem. You know, like Simon Singh's book about Fermat's Last Theorem." [Singh's book was, as everyone in the book business knows, phenomenally successful.]

He perked up. "Oh? What is this problem?"

"Well," I said, "it is the Riemann Hypothesis."

"I see. And what does it say, this Riemann Hypothesis?" asked my agent.

"It asserts that all the nontrivial zeros of the Zeta function have real part one-half," I replied.

My agent looked at me in silence for a minute or two. Then he looked at his food. Then he looked at me again, and said: "You know, John, there are some doors Man was never meant to open."

In spite of this discouraging start, I eventually sold him on the idea. It remained for him to sell it to some publisher. This did not go very well. Months passed, and all we were getting was rejections. Eventually the Riemann project slipped from my mind.

In the summer of 2001 I took my family to China for a few weeks to visit my wife's family and get to know something about the country of half their ancestors. A few days after arriving, I thought I had better check my e-mail, so I logged in at one of the Internet cafés that can be found everywhere in China. The very first e-mail message I opened up was from my agent: "I have placed the Riemann book!" The proposal I had made up was now so far in the past, and I had been so preoccupied with moving my family around China, it was a moment or two before I understood what was meant. *Riemann book? What Riemann book?* Once I did understand, there was very little I could do, other than authorize the agent to negotiate the best deal he could get, which I would sign off on when I came home in the fall.

I duly came home and signed the agreement, which was for a healthy advance from a respectable publisher, with the manuscript to be delivered in January 2003. That gave me fifteen months to write the book, which I thought was not as long as I would have liked, but manageable.

At that point the fickle finger of fate decided to point my way. The publisher had assigned an editor to me, and this editor went off on a tour of some European countries. One of his duties now was to sell translation rights to my book in those countries. Attempting to do so, he discovered an unhappy fact: Two other authors were already at work on Riemann Hypothesis books, one of them with over a year's lead time on us. (The two books were eventually published as *The Music of the Primes*, by Marcus du Sautoy, and *The Riemann Hypothesis*, by Karl Sabbagh; all three books were reviewed on MAA Online.) This kind of thing often happens in book publishing. A certain idea is "in the air," and two or more authors will decide to tackle it. This may not necessarily be bad news. Depending on the timing, one book, if successful, might awaken enough interest to make the others successful, too. However, my publisher took the view that we needed to speed up my particular project dramatically. At their insistence, though with some concessions on my advance to soften the blow, we had to renegotiate the contract. Delivery of the manuscript was now set for June 30, 2002 — a mere eight months ahead. This was a horribly tight schedule.

I dropped everything but some casual web journalism and threw myself into the project, reading everything I could find. Fortunately, I live in an area well-supplied with first-class university math libraries, none of which raised any objection to my walking in and browsing their stacks. I read Euler in Latin and half a dozen authors in German — languages I had learned at school but had mostly forgotten. I badgered Andrew Odlyzko and any other mathematicians willing to be badgered. (And one or two who were not at first very willing. But all were extraordinarily generous with their time and trouble, and I finished the project with a warm regard for mathematicians in general.) I spent hours fiddling with *Mathematica*, a tool I had hardly used before. I attended a scholarly conference on the Hypothesis, much of which went right over my head.

At last, somehow, it all got done. The book came out, and I started consuming my way through the publisher's marketing budget. Though not large, the budget covered several trips to "events" at bookstores and radio stations around the country. I quickly learned some necessary precautions for getting through these events. For example, I learned to make it clear at the very beginning of the proceedings that I am not a mathematician, only a writer who likes math. This allowed me to shrug off with proper insouciance questions like "Don't you think that Connes' noncommutative formulation of Poincaré duality in K-homologies offers a promising approach?" I developed a set of stock responses to commonly asked questions, especially: "What *use* is the Riemann Hypothesis?" I accumulated a repertoire of small jokes and minor theatrical stunts to enliven my talks. I began, in fact, to enjoy myself. just as the marketing budget ran out.

The relative success of *Prime Obsession* — by the end of 2003 we had sold somewhat over 25,000 hardcover copies, whereas the "expected" sales for a book of that type would be in the range of five to ten thousand — caused me much reflection. The book has, after all, a lot of heavy math in it. I had decided from the start that there is no point in writing a book about the Riemann Hypothesis if you don't tell your readers what the Hypothesis *is*, and why mathematicians want to resolve it. To do that, I needed to give my readers a lot of math, so I did it and gave them that math, making it as palatable as I could, and scattering it among the historical and biographical material as thinly as possible. *Prime Obsession* is still, I think, a hard book for anyone who left math behind in high school, and I am not at all sure I understand why so many people have bought it.

Interest in mathematical topics among non-mathematical but well-educated readers is not entirely a new thing. Kasner and Newman's *Mathematics and the Imagination*, first published in 1940, was a great publishing success. (And was an inspiration to me in my teen years.) There are certainly more pop-math books around today than there have ever been. In part I think that this is a consequence of the spread of personal computers. Not that there is much of a direct connection between using a computer and doing math; but widespread acquaintance with, for example, spreadsheet programs, has helped break down the wall of anxiety that left a lot of people repelled by anything to do with math. The rise of experimental math and the availability of picturesque pop-math artifacts like the Mandelbrot set are also part of this phenomenon.

There is also, I think, a deeper issue, having to do with the yearning for certainty in a society of relativistic morality, declining religious faith, economic insecurity, and fast-changing technology. College-educated people of all disciplines have internalized Aristotle's observation that only mathematical knowledge is certain, all other kinds being merely probable. (Whether this is *true* or not is beside the point; I am only saying that most educated Americans are nowadays acquainted with the notion.) Thoughtful people would like to know more about this realm of absolute certainty, as in the world around them they see standards blurring, old verities questioned, new job classifications coming up as long-established old ones fall into oblivion.

I cherish the private fancy that in the particular case of *Prime Obsession* part of the reason for the book's success has been Bernhard Riemann himself. Every book worth reading cloaks a human personality, if only the author's. I was drawn to my topic at first by the personality of Riemann, by the curious contrast between his outer and inner lives: between the shy, timid, sickly, unsocial, poverty-stricken, unhealthy body, and the blazing fire of imaginative genius within. I had all that in mind from the beginning; I dedicated my book, in my prologue, to Riemann's memory; and I like to think that if he is anywhere right now, he is smiling down fondly on my brief, hurried efforts.

John Derbyshire has written two novels in addition to Prime Obsession. *He is a regular contributor to* The Washington Times, The New York Sun, The New Criterion, *and* National Review Online, *where his "Diary" often includes notes on mathematical topics. His personal web page is* http://www.olimu.com.

NSF Beat
Advanced Technological Education

By Sharon Cutler Ross

The Advanced Technological Education program of the National Science Foundation seeks to promote technological education at the secondary and undergraduate levels through curriculum development, preparation and professional development of college and secondary faculty, field experiences, internships, and other activities. This eleven-year-old program has funded nearly 550 projects in three broad categories: ATE projects, ATE Centers, and Articulation Partnerships. Projects focus on program improvement, professional development for faculty, curriculum and materials development, technical experiences, laboratory development, or applied research on the effectiveness of ATE-funded work. ATE Centers are comprehensive national or regional resources that generally involve secondary schools, two- and four-year colleges, business, industry, and government. In addition, the program supports the creation of comprehensive articulation agreements between two-year and four-year institutions either to facilitate the transition of science, technology, engineering, or mathematics (STEM) students or the preparation of STEM K–12 teachers.

The remainder of this article describes a sampling of the more than 200 active ATE-funded projects. Wake Technical Community College, Raleigh, NC, has developed a set of integrated activities to supplement mathematics and physics courses and in another project is conducting summer workshops for secondary and two-year college faculty. In these workshops participants visit industries and construct classroom resources based on the mathematics used in the workplace.

COMAP, Lexington, MA, has progressed from the development of a two-semester program, Developmental Mathematics and its Applications, to the creation of a professional development program for teachers in ATE or ATE-type programs. The TeachMap will help instructors use open-ended, authentic applications, locate sources of new problems, and create appropriate learning environments for these materials.

A Teaching Factory has been created by the project of the City College of San Francisco; the factory setting models the apparel production process. The mathematics modules developed here are implemented in community college and university courses and in some non-credit courses at the Teaching Factory.

Projects that address the issues of faculty preparation in technology-based fields form a large segment of ATE-funded projects. Lee College, Baytown, TX, has created the Teacher Education Alliance for Mathematics and Science by partnering with seven school districts and the University of Houston. Outcomes of the alliance include a team-taught interdisciplinary Physical Science/Algebra course, a revised Mathematics for Elementary Teachers, and a new fully articulated associate degree program for prospective elementary teachers. The Community College of Philadelphia project focuses on the creation of a new degree for prospective secondary mathematics and science teachers. Professional development for two-year college faculty is part of the project being undertaken at Sinclair Community College, Dayton, OH. Four curriculum modules using inquiry-based, authentic learning tasks are being developed and used as the basis of summer workshops for secondary and two-year college faculty.

Preliminary proposals for the next round of ATE funding are due April 21, 2004; full proposals are due October 8, 2004. The National Science Foundation anticipates making up to 65 awards in this program based on projected funding of $38 million.

Earth Day Outreach

By Wm. D. Stone

How fast does an oil-slick grow? Is habitat size really important? How does a plume of smoke spread? Studying questions like these, and modeling the effects of different actions, are some of the ways mathematics is used to study the environment.

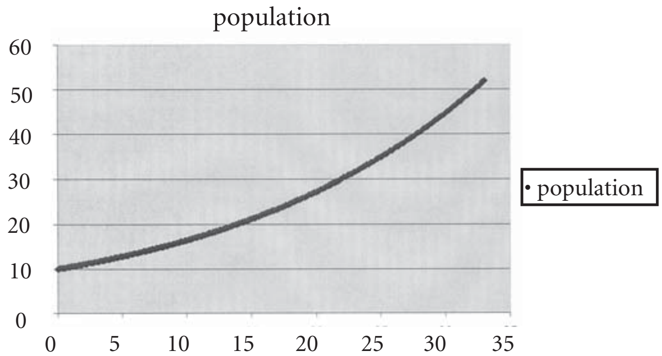
The scene moves to a geometry class. They have been studying circles. We start with a simple assumption about a leaking oil tanker. I give the students the rate at which the oil is leaking and ask them how big the oil slick is. The students talk and argue and decide on some additional information they need. How much is a metric ton? How does that translate into volume? How thick is the oil slick? Eventually we get to a formula for the diameter of the slick as a function of time.

There is more that we can do. What if we consider the current? How does this change the shape? This is actually a difficult question, but with some reasonable simplifications high school students can get an answer.

Next we visit an algebra class. Many questions that might at first glance seem beyond the grasp of a high school class can be modeled and explored using spreadsheets. We can start with simple exponential growth models. Students find it easy to understand that the growth in a population should be proportional to the number of individuals. Since this number is changing, we take a short time step so it doesn't change too much. Now our population at time t1 is the population at time t0 + a constant times the population times the time step (look at the units to convince them of this last term). On a spreadsheet we have:

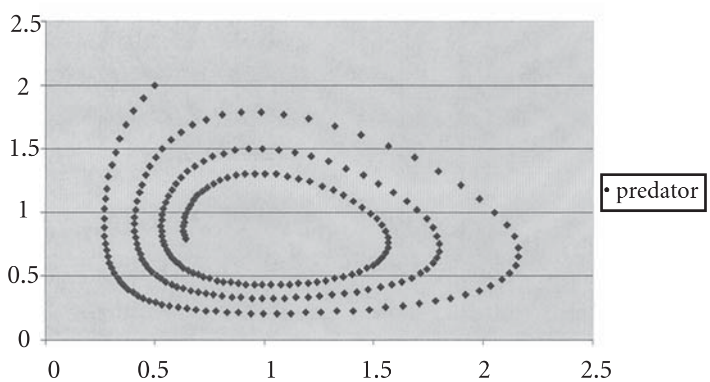
	A	B
1	Time step=	0.1
2	growth rate	0.05
3		
4	time	population
5	0	10
6	=A5+$B$1	=B5+$B$2*$B$1*B5

Carrying this out and graphing we get:



Students readily recognize this as looking like exponential growth.

Next, consider a predator prey system. We might think of this as a system of nonlinear differential equations, well out of the reach of most high school students. A little exploring with students, though, and they come up with the appropriate spreadsheet, and end with the following graph:



Environmental mathematics can be a great way to show high school students how the math they are learning can be used. High school teachers are usually happy to have someone come in to their classroom and show the students some applications; high school students are interested in environmental problems.

Because environmental models provide such an excellent opportunity for outreach, the Environmental Mathematics committee of the MAA is encouraging all mathematicians interested in environmental mathematics or modeling to participate in our Earth Day Outreach. This April, give a talk in a local high school showing how mathematics can be used to study the environment.

If you don't have a contact with your local high school, your admissions office probably does. If you aren't sure what to talk about, there are several possibilities posted on the Environmental Mathematics Committee's webpage, which can be found at http://www.nmt.edu/~wdstone/www/EnvironMath/CommEnvMathCoverPage.htm (click on *Earth Day Talks*). If you have good ideas for more talks, send them to me at wdstone@nmt.edu. I'll add them to the page of suggested topics. The committee would also like to hear from people who actually participate — what did you present, how many students were there, how did it go? We'll have a follow-up article about this event!

Wm. D. Stone teaches at the New Mexico Institute of Mining & Technology in Socorro, NM. He is Governor of the Southwestern Section of the MAA.

Mathematical Art Exhibit at the Joint Meetings

After the 2003 Math Awareness Month with its focus on art, mathematicians have become more aware of the range of artists that use mathematical elements in their work. At the Phoenix Joint Meetings, a Mathematical Art Exhibit displayed interesting examples of this kind of art. Organized by Robert Fathauer of Arizona State University, the exhibit included paintings, prints (both digital and traditional), and sculpture. The works drew on many mathematical or quasi-mathematical ideas: fractals, symmetry, tilings, topology, polyhedra, unusual perspective, anamorphosis, and optical illusions.

PMET — PREPARING MATHEMATICIANS TO EDUCATE TEACHERS

PMET Workshops for Summer 2004

A growing set of national reports calls for better preparation of the nation's mathematics teachers by mathematics faculty. To help meet this need, the Mathematical Association of America has developed a multifaceted program, Preparing Mathematicians to Educate Teachers (PMET). During summer 2004, PMET will offer eight new workshops for college and university faculty members who teach mathematics courses taken by prospective teachers. Each workshop will focus on preparing teachers for elementary, middle, or secondary school mathematics. Participants will observe demonstration classes, providing an opportunity to learn about the mathematical thinking processes of students preparing for careers in teaching. Participants will also have opportunities to share ideas, discuss, and learn more about appropriate content and ways of teaching prospective teachers more effectively.

Elementary-level Workshops:

June 13-19, 2004
Humboldt State University, Arcata, CA
Phyllis Chinn and Dale Oliver

June 13-25, 2004
Kent State University, Kent, OH
Michael Battista and Olaf Stackelberg

July 11-17, 2004
State University of New York at Stony Brook, Stony Brook, NY
Kathy Ivey and Alan Tucker
August 1-7, 2004
University of Nebraska-Lincoln, Lincoln, NE
Ruth Heaton and Jim Lewis

Middle School-level Workshops:

May 30-June 6, 2004
Appalachian State University, Boone, NC
Holly Hirst and David Royster

June 20-27, 2004
Bowling Green State University, Bowling Green, OH
Thomas Hern and Barbara Moses

Secondary-level Workshop

June 6-18, 2004
State University of New York at Oswego, Oswego, NY
Jack Narayan and Steven West

June 21-July 2, 2004
University of San Diego, San Diego, CA
Magnhild Lien and Perla Myers

PMET is supported by the National Science Foundation grant DUE-0230847, with additional support for workshops from Texas Instruments. Check the project website for full information, including workshop descriptions and applications: http://www.maa.org/pmet.

PREP

Professional Enhancement Programs of the MAA

The Mathematical Association of America's Professional Enhancement Program (PREP) enables faculty in the mathematical sciences to respond to rapid and significant developments that impact undergraduate mathematics. PREP workshops offer extended professional development experiences with active involvement by all participants, leadership by experts, and a commitment by participants to make use of what they learn. To achieve a sustained impact, PREP workshops extend over time with preparatory, intensive and on-going components. Follow-up components are typically held in conjunction with the Joint Mathematics Meetings each January.

2004 Professional Enhancement Program Workshops

Geometric Combinatorics
Francis Edward Su
May 23-27, 2004 - Mathematical Sciences Research Institute, Berkeley, CA
Cosponsored by the Mathematical Sciences Research Institute (MSRI)
Registration: $250
Application Deadline: April 16, 2004

Mathematics Meets Biology: Epidemics, Data Fitting, and Chaos
Azmy Ackleh, Sophia Jang
May 26 - 29, 2004 - University of Louisiana at Lafayette, Lafayette, LA
Registration: $250
Application Deadline: April 16, 2004

Nifty Applications in Discrete Mathematics
Bill Marion, Doug Baldwin, Susanna Epp, Peter Henderson
June 7-11, 2004 - Valparaiso University Valparaiso, IN
Registration: $250
Application Deadline: April 23, 2004

The Geometry of Vector Calculus
Tevian Dray, Corinne Manogue
June 18-22, 2004 - Mount Holyoke College, South Hadley, MA
Material for this workshop developed with support from NSF Grants DUE-0088901 and DUE-0231032
Registration: $250
Application Deadline: May 7, 2004

Statistical Ratemaking
Tom Struppeck
June 21-25, 2004 - Tulane University, New Orleans, LA
With support from the Casualty Actuarial Society
Registration: $250
Application Deadline: May 7, 2004

Revitalizing Your Developmental Mathematics Courses: A Context-Driven, Activity-Based Approach
Nancy Crisler, Gary Simundza
June 21-25, 2004 - Foothills Conference Center, University of California-Berkeley, Berkeley, CA
Co-sponsored by Key College Publishing and COMAP, Inc.
Registration: $250
Application Deadline: May 7, 2004

Leading the Academic Department: A Workshop for Chairs of Mathematical Sciences Departments
Arnie Ostebee
June 24-27, 2004 - Washington, DC
Registration: $500
Application Deadline: May 14, 2004

Exploring Abstract Algebra Using Computer Software
Russell Blyth, Julianne Rainbolt
June 28 – July 2, 2004 - Online from Saint Louis University, Saint Louis, MO
Registration: $100
Application Deadline: May 14, 2004

Computational and Mathematical Biology
Eric Marland, Robin Davies, Chris Fall, Laurie Heyer, Timothy Lewis, Raina Robeva
July 11-17, 2004 - North Carolina Agricultural and Technical University, Greensboro, North Carolina
Offered in conjunction with the National Computational Science Institute workshop on Computational Biology for Biology Educators
Registration: $300
Application Deadline: May 28, 2004

Quantitative Literacy Across the Curriculum: Everybody's Project

Emily Lardner, Gillies Malnarich, Caren Diefenderfer, Dorothy Wallace, Jan Ray, Len Vacher, Kim Rheinlander, Sue Mente, Deann Leoni, Judy Moran, Rob Cole, Jerry Johnson

August 17-20, 2004 - Sleeping Lady Mountain Resort, Leavenworth, Washington

Registration: $250

Application Deadline: July 2, 2004

PREP is a project of the MAA funded by the National Science Foundation DUE . PREP programs are equally open to all faculty, independent of whether or not they are members of the MAA or any other professional organization. Application materials and additional information available at http://www.maa.org/prep. *Register early as space is limited.*

What's the Best Textbook?—Linear Algebra

By Jerry G. Ianni

The fearless editor of FOCUS observed last August that "the best textbook" is not a well-defined concept. The case of linear algebra is especially problematic because the essence of the subject itself has been debated. In January, 1993, the editors of *The College Mathematics Journal* published a special issue with the hope of advancing the discussion about "the syllabus for introductory linear algebra." That issue is an excellent reference for historical perspective on linear algebra in the undergraduate mathematics curriculum. It also provides the reader with solid intuition about the choice of topics in the current textbooks.

Alan Tucker notes in [3] that linear algebra first appeared in the curriculum as part of abstract algebra, in the 1940s and 1950s. The focus was placed on the "algebraic structure of linear maps." Only limited attention was given to the matrices representing these transformations. The first lower-division undergraduate text with vector spaces, says Tucker, was *Finite Mathematical Structures* by Kemeny et al. (1959). This textbook included matrix applications such as Markov chains and linear programming. Nevertheless, lower-division linear algebra courses in the 1960s emphasized providing an "accessible, geometrically based theory" in preparation for "more abstract, upper-division mathematics courses" and providing a "framework" for a "vector-space approach" to multivariate calculus.

However, the use of matrix-based models has exploded since the 1960s, partly because of the availability of powerful computers. As a result, there has been a considerable expansion in the audience for linear algebra courses. For institutions that can offer only one such course, Tucker argues that "the challenge is to try to find a middle ground blending vector spaces and matrix methods and at a level that does not scare off users and yet smooths the transition for mathematics majors to advanced courses". With specific reference to difficulties with core abstract ideas such as subspace, span, and linear independence, David Carlson comments in [1] that "these concepts are introduced without substantial connection with students' prior experience … and without significant examples or applications. This style is appropriate for a research paper — not for lower-division textbooks."

Attempting to achieve the balance described in the previous two paragraphs, my vote for the best textbook goes to *Linear Algebra and Its Applications* by David C. Lay. Its present incarnation is the third edition (2003). We have been using this book at LaGuardia Community College for several years, and it has served our student population well. This audience consists primarily of Computer Science majors, but there are also a few Computer Information Systems majors and Mathematics majors as well. The prerequisite for our linear algebra course is Calculus I. Many of our students are recent immigrants with an unsophisticated grasp of the English language, and many of them have not developed abstract reasoning skills.

Besides the fact that Lay's textbook is quite readable, the single most important feature is its consistent introduction and reinforcement of abstract concepts in a computational context. This setting helps the students to perceive the new ideas as "real", and it also helps them to absorb relevant notation into their "active" language. A very nice example of this placement of abstraction within the concrete occurs in Sections 1.3 and 1.4 wherein Lay introduces vectors, linear combinations, and matrix-vector products. Vectors are easily digested as matrices with precisely one column, and linear combinations are then introduced computationally as sums of scalar multiples of the vectors. The slick and smooth abstract transition occurs when Lay *defines* matrix-vector products as linear combinations of the columns of the matrix using the entries of the vector as scalars. This statement remains technically precise, provides a direct interconnection with geometric applications such as the span of a set of vectors, and generalizes easily to the definition of the product of two matrices.

Lay provides a very thorough treatment of abstract vector spaces that will meet the needs of balanced introductory linear algebra courses at most institutions. However, I especially enjoy utilizing an alternative treatment of vector space concepts for subspaces of $\mathbf{R}^n$. It covers all of the fundamental ideas such as column space, null space, basis, coordinate vectors, dimension, and rank. This level of abstraction is within the reach of our students because of the computational environment.

One other nice feature of the streamlined access to vector space concepts provided by Lay's textbook is that it allows the instructor the flexibility to include modern applications within the syllabus of the first semester course. In my case, I incorporate a one-week introduction to algebraic coding theory immediately after the discussion of subspaces of $\mathbf{R}^n$. The material is based on supplemental notes from other sources. However, it contrasts well because the coding procedures give the student a purely algebraic application of coordinate vectors, whereas Section 2.9 provides a geometric application.

Let the discussion of the introductory linear algebra syllabus continue!

References

1. David Carlson, Teaching Linear Algebra: Must the Fog Always Roll in?, *The College Mathematics Journal*, 24 (1993) 29-40.
2. David Carlson, Charles R. Johnson, David C. Lay, A. Duane Porter, The Linear Algebra Curriculum Study Group Recommendations for the First Course in Linear Algebra, *The College Mathematics Journal*, 24 (1993) 41-46.
3. Alan Tucker, The Growing Importance of Linear Algebra in Undergraduate Mathematics, *The College Mathematics Journal*, 24 (1993) 3-9.

Jerry G. Ianni is an Assistant Professor of Mathematics at Fiorello H. LaGuardia Community College of the City University of New York, located in the western part of Queens County. He serves as the Linear Algebra course coordinator for the Mathematics Department.

Letters to the Editor

Bad URL

As usual, there are lots of little errors in FOCUS, but I was very put out when the URL given on page 17 of the January issue http://www.ma.hw.ac.uk/Endg/fom.html did not work.

Martin C. Tangora
University of Illinois at Chicago

Alas, errors happen despite our efforts. We do try!

The URL did get mangled, probably in the course of electronic transmission. The correct URL is http://www.ma.hw.ac.uk/~ndg/fom.html. *Sorry!*

SPSS?

I read the interesting article by Professors Beneteau and Rohrbach in FOCUS, January 2004. I always thought, however, that SPSS is the acronym for *Statistical Package for Social Sciences* and not *Statistical Product and Service Solutions* as stated in the article.

George Avirappattu
Kean University

June Rohrbach responds:

In 2001, when we adopted the textbook, *Social Statistics: An Introduction Using SPSS for Windows* by J. Kendrick, we were given the information that when the company was first created, SPSS stood for "Statistical Package for the Social Sciences." SPSS became the registered trademark of SPSS, Inc., and it stands for "Statistical Product and Service Solutions", which appeals to a broader audience. This may have been changed again since that time.

In fact, the SPSS web site seems to indicate that at this point "SPSS" is no longer supposed to be an acronym for anything!

Identifying Talent: American Mathematics Competitions

By Steven R. Dunbar

Many readers of FOCUS may remember taking a multiple-choice mathematics contest sponsored by the MAA while they were in high school. In 1950, the New York Metropolitan Section of the Mathematics Association of America (MAA) sponsored the first Mathematical Contest. A total of 238 schools and around 6,000 students in the New York area participated. Since 1952, the MAA has sponsored the contest nationwide through the American Mathematics Competitions Program. In 2000, the contest formerly known as the American High School Mathematics Exam (or AHSME) changed names and split into two contests, the AMC 10 and AMC 12. In February 2002, over 240,000 students at over 4100 schools world-wide took the AMC 10 and AMC 12 contests.

The AMC 12 is a 25-question, 75-minute multiple-choice examination on secondary school mathematics with problems that students can understand and solve with only pre-calculus concepts. For the year 2004 there will be two dates on which two different versions of the contest may be taken: Contest A on February 10, 2004 and Contest B on February 25, 2004.

The main purpose of the AMC 12 is to spur interest in mathematics and to develop mathematical talent through solving challenging problems in a timed multiple-choice format. A special purpose of the AMC 12 is to help identify students with truly exceptional mathematics talent. The AMC 12 is the first in a trio of contests followed in the United States by the American Invitational Mathematics Examination (AIME) and the USA Mathematical Olympiad (USAMO) that culminate in participation by the U.S. team at the International Mathematical Olympiad, the most prestigious secondary mathematics contest in the world.

The AIME is a 15-question, 3-hour examination in which each answer is an integer from 0 to 999. The questions on the AIME are more difficult than the AMC 12 and students are very unlikely to obtain the correct answer by guessing. As with the AMC 10 and AMC 12 (and the USAMO), all problems on the AIME can be solved by pre-calculus methods. The use of calculators is not allowed on the AIME and USAMO. The AIME provides the exceptional students who are invited to take it with yet another opportunity to challenge their mathematical abilities.

The AMC invites about 250 of the best scorers on a weighted combination of the AMC 12 and the AIME to take the USAMO. The USAMO is a 6-question, 9-hour proof-type examination spread over two days, the same format as the IMO. The USAMO provides a means of identifying and encouraging the most creative secondary mathematics students in the country. It serves to indicate the talent of those who may become leaders in the mathematical sciences of the next generation.

A good question is whether these contests sponsored by the AMC program of the MAA do identify talented students who become leaders in the mathematical sciences. The answer is yes: many of the nation's top mathematicians and scientists have been very successful on these contests. In 1986, Prof. Nura Turner of the SUNY Albany did a follow-up study of 120 high scorers from the years 1958-1960 of the AHSME competitions, before there was an AIME and USAMO to further single out talented students. About 53% of high scorers had gone on to success in mathematics and computer science, but the career accomplishments of the high scorers ranged from captains of nuclear submarines to captains of industry.

The only perfect scorer on the 1950 Mathematical Contest was Paul Monsky, from Stuyvesant High School in New York City. He repeated as perfect scorer on the first national contest. He is now a professor of mathematics at Brandeis University.

The high scorer at DeWitt Clinton High School in the Bronx on the first national contest in 1953 was Leo Kadanoff. He has since become a physicist and was a recipient of the 1999 National Medal of Science. Kadanoff has been a leader in fundamental theoretical research in statistical, solid state and nonlinear physics, and in particular, showed that sudden changes in material properties (for example, the magnetization of a magnet or the boiling of a fluid) could be understood in terms of the mathematical techniques of scaling and universality.

One of the perfect scorers on the 1962 AHSME was Barry Simon, then at James Madison High School in Brooklyn. Many readers will recognize him as one of the co-authors of a well-known four-volume series of books on the methods of mathematical physics. He received a Ph.D. in physics from Princeton in 1970; all of his professorial appointments have been jointly in mathematics and physics. He is currently the IBM Professor of Mathematics and Theoretical Physics at Caltech. He is a former vice president of the American Mathematical Society.

After a presentation on some of the results of the American Mathematics Competitions, I received a copy of an awards list from the Maryland-DC-Virginia Section of the MAA from Jerry Grossman, Governor of the Michigan section. As a senior in high school, Jerry had placed second in the Section on the AHSME and had received a savings bond as an award from the section. The list of awardees had the top 10 in the section, and eighth on the list was a high-school sophomore from Maryland named Edward Witten. Witten is now another well-known mathematical physicist. He was awarded a MacArthur Fellowship in 1982 and the Fields Medal in 1990. Witten may be best known as the world leader in "string theory," an attempt by physicists to describe in one unified way all the known forces of nature. He was awarded the National Medal of Science in October 2003.

It is easiest to identify the talent by looking at the annual list of participants on the US teams to the International Mathematical Olympiad. The lists are short, and these students had at that time passed through all levels of competition and distinguished themselves by their accomplishments at the IMO. In 1974, the United States fielded its first team to the IMO, and that team proved to be a very distinguished group indeed.

The best known member of that first team of 6 is Eric Lander, another Stuyvesant High student and captain of the Stuyvesant Math Team. Eric Lander is now one of the driving forces behind the revolution in genomics, the study of all of the genes in an organism and how they function together in health and disease. He has been one of the principal leaders of the Human Genome Project. Lander is a Member of the Whitehead Institute, director of the Whitehead's Center for Genome Research, and professor of biology at MIT. Lander was a Rhodes Scholar and received his D.Phil. in mathematics from Oxford University in 1981. His many honors and awards include the MacArthur Foundation Prize Fellowship (1987), member of the National Academy of Sciences (1997), and the Institute of Medicine (1998).

A second member of that U.S. team to the 1974 IMO is well-known to the MAA. Paul Zeitz graduated from Stuyvesant High School in 1975. While in high school, he placed first at the 1974 USAMO. The next year he won the prestigious Westinghouse Science Talent Search. In 1980 Paul completed his undergraduate studies at Harvard with a degree in history. From 1980 to 1986 he taught high school math in Colorado Springs and San Francisco. He received a Ph.D. in mathematics from UC Berkeley in 1992. He was honored, in March 2002, with the Award for Distinguished College or University Teaching of Mathematics, by the Northern California Section of the MAA, and in January 2003, he received the MAA's national teaching award, the Deborah and Franklin Tepper Haimo Award.

Peter Shor

Peter Shor was a member of the 1977 U.S. IMO team. He received his B.S from Caltech in 1981 and his Ph.D. from M.I.T. in 1985. Peter Shor has been a researcher at AT&T since 1986, and has focused on theoretical computer science. In 1994, he showed that if you could build a quantum computer, you could factor large numbers and thus break the RSA cryptosystem. More recently he has developed quantum error-correcting codes, and shown that they can be used to make quantum computers fault-tolerant, a crucial step if quantum computers are ever to be built. In August, 1998, Shor received the 1998 Nevanlinna Prize for his contributions to information sciences, particularly in quantum computing. The Nevanlinna Prize is one of the world's most prestigious awards in mathematics and computation and is presented every four years to the most distinguished computer scientist from the under-40-year-old generation. Peter Shor was named a 1999 MacArthur Fellow.

Noam Elkies

Noam Elkies is another Stuyvesant High School graduate who became a member of the US team to the IMO. In 1981 he tied for first in the USA Math Olympiad and took home a Gold Medal with a perfect score at the International Math Olympiad in Washington, D.C. In 1982 he repeated, first in USA Math Olympiad; Gold Medal at the International Math Olympiad in Budapest, Hungary. In 1982, he was 8th in the Westinghouse Science Talent Search. In 1982 to 1984 he was a Putnam Fellow in the 42nd, 43rd and 44th Putnam competitions. In 1987, he found a counterexample to a conjecture of Euler concerning the sums of fourth powers of integers. Elkies is also an accomplished composer and pianist. He is the youngest professor ever tenured at Harvard, and he won the world championship in posing and solving chess problems in 1996.

More recent participants in the AMC contests haven't had the time (yet!) to accumulate the same level of results. Many of the Putnam Fellows of recent years have been high scorers on the USAMO, as would be expected. One of the most professionally prominent of recent high scorers is Leonard Ng. Leonard is currently in his second year of a postdoctoral fellowship from the American Institute of Mathematics, and is working at Stanford University and AIM.

Melanie Wood was the first female ever to participate on the U.S. team for the International Mathematical Olympiad, in 1998. She has just won the 2003 Morgan Prize for research by a mathematics undergraduate (see February 2004 FOCUS).

The AMC contests challenge students with significant, but accessible, mathematics at a crucial moment in their intellectual development. Through this program, the MAA identifies and encourages the future leaders of the mathematical profession.

Steven Dunbar is MAA Director of Competitions. He can be reached via email at sdunbar@math.unl.edu.

Year 2004 Grants for Women and Mathematics Projects

The MAA plans to award grants for projects designed to encourage college and university women or high school and middle school girls to study mathematics. The Tensor Foundation, working through the MAA, is soliciting college, university and secondary mathematics faculty (in conjunction with college or university faculty) and their departments and institutions to submit proposals. Projects may replicate existing successful projects, adapt components of such projects, or be innovative. Possible projects might include:

- organize a club for women interested in mathematics or mathematics and science;
- provide release time to allow a faculty member to prepare a course on women and mathematics, provided the host institution agrees to offer such a course;
- create a network of women professional mentors who will direct mathematics projects for girls;
- hold a conference for counselors to prepare them to encourage women and girls to continue to study mathematics;
- conduct a summer mathematics program for high school women;
- bring high school women onto a college campus for a Math Day with follow-up;
- structure a program for high school and/or college women to mentor younger female mathematics students with math projects or math clubs;
- form partnerships with industry to acquaint women students with real-life applications of mathematics.

The MAA/Tensor Foundation Program aims to encourage mathematics faculty to develop projects to increase participation of women in mathematics, and to provide support to those who act on our encouragement and become project directors.

Grants will be up to $5,000 and will be made to the institution of the project director to be spent within the year. An institution is expected to supply matching funds or in-kind support as an indication of commitment to the project. These grants will not support any institutional indirect costs or provide fringe benefits. To provide maximum flexibility, unexpended funds may be carried forward. Some grants may be renewed for a second year. Grants can be made to both college and university mathematics faculty and to secondary school or middle school mathematics faculty working in conjunction with college or university faculty.

Proposals will be evaluated by a review committee which will include members of the MAA Committee on Participation of Women, Women & Mathematics Network, and a trustee of the Tensor Foundation. The three-page (maximum) proposal should be in a font that is easy to read and not include any attachments except a vita and letters of support. The following issues should be addressed:

Concept: What are your ideas and philosophy about mathematics and education that form a basis for your project?

Rationale: In what way will your institution be a welcome host for the project?

Objectives: What are the objectives of your project?

Activities: What tasks do you plan to undertake for your project? Describe the mathematics content and activities you expect to provide participants.

Personnel: What is the name, position, and qualifications of the proposed project director? Who else will be involved in the project? How?

Evaluation: How will you judge the success of this project?

Budget: How will your funds be spent—personnel, materials, release time, etc.? An additional budget page is requested from all proposers.

Commitment: What is the potential for long-term commitment of the host institution?

Future funding: What is the likelihood of institutionalization through local or state funding after start-up funding from the Tensor Foundation?

Timeline: When will you carry out the activities?

Characteristics of Effective Projects

While differences occur among highly successful intervention projects, there are some characteristics which effective projects targeting women and girls seem to share:

- project goals clearly articulated and measurable;
- strong academic component; focus on enrichment, not remediation;
- teachers highly competent in the subject matter who believe that women can learn the material;
- heavy emphasis on every-day applications of mathematics and on careers in the field;
- teaching strategies that take into account the needs and cognitive development of women and girls;
- role models;
- parents, teachers, guidance counselors involved;
- strong directors and a committed and stable staff;
- development of a peer support system;
- institutional commitment.

Brief descriptions of programs previously funded by Tensor are available online at http://www.maa.org/projects/tensor_samples.html. See also http://www.maa.org/projects/tensor_solic.html.

Submission of Proposals

Proposals should be submitted as soon as possible, but must arrive no later than **March 12, 2004**. *Please send eight (8) copies of the proposal.* All proposers will be notified by the end of March, 2004. The MAA/Tensor Foundation intends to make ten grants.

Please do not hesitate to contact Program Director Florence Fasanelli for assistance in preparing your proposal. She can be reached by email at ffasanelli@juno.com, by phone at 202-966-5591, or by mail at the MAA headquarters.

Employment Opportunities

OHIO

The Ohio State University at Marion
Department of Mathematics
Applications are invited for a tenure-track faculty position at the Assistant Professor level, effective Autumn Quarter 2004. The successful candidate will hold rank in The Ohio State University in the Department of Mathematics. Candidates must have a Ph.D. degree and a strong commitment to both teaching and research. Candidates in all areas of pure and applied mathematics are invited to apply. Evidence of accomplishment in mathematical research and excellent teaching ability are required. Ability to teach mathematics courses for education students and basic courses in statistics and/or computer science is desired. Teaching responsibilities will be at the undergraduate level. The cover letter should include a brief description of teaching experience and research interests. Applicants should send a current vita and arrange for three letters of reference (at least one of which addresses the candidate's teaching qualifications) to be sent to Math Search, The Ohio State University, Marion Campus, Human Resource Office, 124 Morrill Hall, 1465 Mt. Vernon Ave., Marion, OH 43302. Applications will be screened beginning April 1, 2004, but will be considered until the position is filled.

We seek applicants committed to undergraduate education, interested in teaching in a multidisciplinary, small college atmosphere within one of the nation's premier land grant universities. The Ohio State University at Marion provides approximately 1600 commuter students with courses at the undergraduate and graduate levels. The campus has direct connections to main campus computers, and is one hour from Columbus. Information about the Marion campus is at www.marion.ohio-state.edu. The Department of Mathematics is at www.math.ohio-state.edu

The Ohio State University is an Equal Opportunity, Affirmative Action Employer. Women, minorities, veterans, and individuals with disabilities are encouraged to apply.

TENNESSEE

Tennessee State University
Tennessee State University invites applications and nominations for the position of Assistant/Associate Professor of Mathematics (Tenure-Track). Teach undergraduate and graduate mathematics courses; advise and mentor mathematics majors. Engage in grant development and scholarly research; serve on departmental and college committees; participate in public service projects and maintain collegial relations with colleagues. Ph.D. in mathematics or mathematical statistics at the time of appointment; demonstrated commitment to academic excellence; evidence of effective oral and written communication skills. Strong potential for establishing a solid record of research and publications. Minimum of five years teaching experience at a regionally accredited four-year college or university required for appointment to the rank of associate professor.

Salary range: $40,000-$50,000

Deadline for application: March 31, 2004
Please forward cover letter and resume to:

Tennessee State University
Office of Human Resources
3500 John A. Merritt Blvd.
Nashville, TN 37209
An EO/AA/M/F employer