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On the cover: Megan Guichard, a junior counselor at Mathcamp (see page 4) displays her mathematically-interesting hair. Photograph by Chris Tuffley.

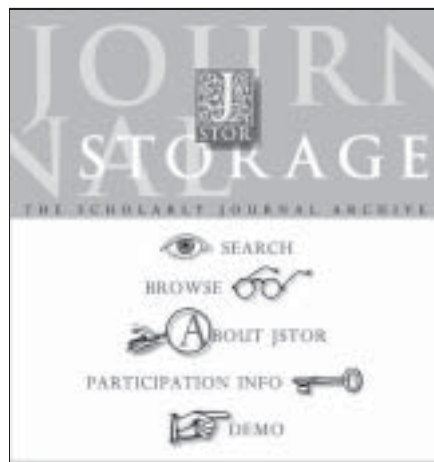
FOCUS Deadlines

	February	March	April
Editorial Copy	December 14	January 15	February 4
Display Ads	December 21	January 29	February 25
Employment Ads	December 10	January 15	February 11

JSTOR to Include *Mathematics Magazine* and *College Mathematics Journal*

The JSTOR Board of Directors approved, in its October 2001 meeting, the addition of *Mathematics Magazine* and the *College Mathematics Journal* to their web-based electronic archive. JSTOR (the name stands for “Journal Storage”) offers its subscribers access to the complete runs of many scholarly journals, including the *American Mathematical Monthly*. The journals archived at the JSTOR site are fully searchable and give access to high-quality page images that produce beautiful printout.

It is expected that the two MAA journals will be added to JSTOR by early 2002, making it possible for JSTOR subscribers to access electronic archives of the three main MAA journals from their inception through 1997. (A five-year “moving wall” is maintained to preserve the subscriber base of each journal.)



Members of institutions that are JSTOR subscribers can access the archive at <http://www.jstor.org>. Those individuals who do not have JSTOR access through their institutions can obtain annual subscriptions through the MAA. ■

MAA to Host Meeting for NSF PIs

The Mathematical Association of America has been awarded a grant of \$168,548 by the National Science Foundation to host a meeting of Principal Investigators of NSF-funded mathematics projects in the Division of Undergraduate Education. The meeting will take place March 14-16, 2002 in Washington, DC. The focus of the meeting will be on dissemination of project materials. Within the meeting there will be two workshops: one on writing learning materials and the other on preparing learning materials for interactive, online use. Lang Moore, Visiting Mathematician at MAA, is the principal investigator for this project; Tina Straley, Executive Director of MAA, is a co-PI. ■

Have You Seen the BIG SIGMAA Web Site?

The BIG SIGMAA is the special interest group within the MAA devoted to mathematics and mathematicians in Business, Industry, and Government. BIG was the second SIGMAA to be approved by the Board (the other two SIGMAAs Focus on Research on Undergraduate Education and Statistics Teaching). The BIG SIGMAA web site, at <http://www.math.unt.edu/bigsigmaa/>, has information about the SIGMAA and its officers, announcements of program items at the Joint Mathematics Meetings in San Diego, a technical questions discussion board, and lots of information about non-academic careers in mathematics. The site is maintained by Peter DeLong; he can be reached by email at R_Peter_DeLong@res.raytheon.com. ■

Reforming Math Teaching in Houston



Governor-at-large Jacqueline Brannon Giles, seen above with Dr. Llayron L. Clarkson and Mrs. Charlotte Haynes, attended the HU-LINC meeting on October 12, 2001 to learn more about the implementation stage of the urban systemic initiative in Houston. The Houston Community College System Central College has initiated a proposal to join the coalition of colleges, universities, schools and other entities that provide technology-integrated mathematics and science professional development for elementary, middle, and high school teachers. Other schools in the coalition include the University of Houston-Downtown, Texas Southern University, Prairie View A and M University, Rice University, and many others. For more information on HU-LINC, contact Charlotte Haynes at chaynes@houstonisd.org. ■

From the Editor

In a forthcoming issue, we hope to publish in FOCUS a set of articles discussing mathematics on the internet: what is available, how it is (or can be) used, who uses it, how good it is. I would like to invite our readers to contribute to that issue. If you have observed or studied students' use of the internet, have participated in the process of creating a mathematically-oriented web site, or just have a site you would like to review, consider submitting an article to us. You can reach me by email at fqgouvea@colby.edu (this is by far the best way) or at Department of Mathematics, Colby College, Mayflower Hill 5836, Waterville, ME 04901.

Fernando Q. Gouvêa

I'd Rather Go to Mathcamp

By Brenda Fine

Last winter, Wellesley assistant professor Mira Bernstein, then a postdoctoral fellow at Berkeley and a co-worker of mine during the previous summer, brought to my attention a series of advertisements that were running in the popular teen magazine *Seventeen* as part of an aggressive anti-drug campaign. One of them featured a photograph of a teen-aged girl whose crush had just offered her some (unspecified) sort of illicit substance. The full-page ad suggested a variety of ways for the girl, and others in her position, to express indignation regarding this offer, but one stood out as particularly damning: “I’d rather go to Mathcamp than smoke a joint!”

Although the ad was soon pulled, there is no denying that it reflected a popular mindset among its audience of teenagers — and, indeed, among the public at large. Advertisers can hardly be blamed for capitalizing on this phenomenon. When a million ads fail to quell the argument that marijuana has its therapeutic uses, one might as well take advantage of the fact that mathematics is all but universally regarded as bad medicine.

Nevertheless, one particular segment of the market was conspicuously overlooked by the designers of this advertising campaign: the participants and staff (graduate student “mentors,” who teach, and undergraduate “junior counselors,” who handle nonacademic work) at the real-life Mathcamp, where Mira Bernstein and I spend our summers.

Mathcamp was founded in 1993 on a wing and a prayer by Dr. George Rubin Thomas, who recognized that teenagers interested in mathematics often lacked the resources — and the camaraderie — necessary for them to thrive as mathematicians. Under the direction of Dr. Thomas, Dr. Mira Bernstein, McGill postdoctoral researcher Dr. David Savitt, and a host of dedicated counselors and instructors who thrive on hundred-hour,

exciting mathematics and people who can relate to that excitement. Indeed, the energy and enthusiasm for mathematics that staff and campers alike bring to the camp environment is palpable. For five days a week during the five-week camp, students can choose courses tailored to their backgrounds and interests from a packed schedule that includes classes on all sorts of subjects. Some courses, including linear algebra, number theory,

fractals, real analysis, projective geometry, and topology, are taught over the course of several weeks, and introduce students to the rigors of university level mathematics while incorporating fun applications that students aren’t likely to see as undergraduates. Other classes are one-time affairs that cover more whimsical topics such as *False Proofs* (students are challenged to find the flaws), *Van der Waerden’s Theorem* (whose instructor, Mathcamp mentor Julian Gilbey cau-

tioned, “If you are afraid of big numbers, don’t take this class!”), and *Hats and Codes* — Mira Bernstein’s presentation of an unexpected synthesis of Hamming codes with a problem about guessing the color of one’s hat. (See the November issue of FOCUS.)

Mathcamp’s goal isn’t to give students the credits (or even the knowledge) that they’d otherwise obtain in their high school classes — after all, most of our campers aren’t any more interested in doing even *more* high school mathematics than are any of their less-mathematically-g geared classmates. Instead, Mathcamp aims to show campers awe-



Camper Pradeep Mouli peers out from a Zometool Cage. Photo by Chris Tuffley.



George Hart puts the finishing touches on a camper’s makeshift Zome home. Photo by Chris Tuffley.

math-filled workweeks, every year enthusiastic young mathematicians can interact with spirited university math students and professors from around the world. The camp itself migrates from summer to summer, and over the years has found temporary homes in Vancouver, BC, Seattle, WA; Toronto, ON; Wellesley, MA; and, most recently, in Waterville, ME, where Colby College hosted 115 gifted high school students and nearly three dozen staff and visiting speakers.

Far from being a chore for the staff and a punishment (or a pretense for turning down joint-smoking potential dates) for the campers, Mathcamp is an oasis of

inspiring results, connections between seemingly unrelated branches of mathematics, and overall “cool math”.

By and large, students seem to think that we’ve succeeded. Even though attendance in classes is not mandatory and the atmosphere at the camp is very informal and relaxed, every hour of every day is a flurry of mathematical activity. Much of this activity takes the form of problem sets and class notes, but a large proportion of it involves solving Rubik’s Cubes and building structures out of Zometool, a geometrical construction tool. Moreover, mathematics permeates nearly every aspect of the camp. One might not think that an cappella group could possibly have much to do with math, but in the hands of counselor Ari Nieh, the *Mathcamp Contrapositiones* — whose repertoire included the song “Nonabelian”, written by mentors Chris Tuffley and Mary Pat Campbell and sung to the tune of Simon and Garfunkel’s “Cecilia” — produced the quintessential marriage of mathematics and music.

At the end of the camp, our students’ most common complaint about their five-week stay isn’t “too much math,” as might be the case with most teenagers, but rather “scheduling conflicts” — that is, too much *cool* math for them to experience all at once. When I polled the Mathcamp alumni for ideas for this article, one camper, high school senior Tracy Lau from Burnaby, British Columbia, enthused about two of her favorite aspects of the camp: “freedom” and “math all day long without ridicule.” The juxtaposition of those two items speaks volumes about the level of motivation and love of their subject that our campers bring with them. Even professional mathematicians are struck by the camp environment: after visiting the camp in 2000, Yale Professor Serge Lang declared Mathcamp to be “the largest concentration of intelligence and math freaks” he had ever seen — and that’s in some five decades of work in the field.

Professor Lang is but one of dozens of visiting professors who have enjoyed a symbiotic relationship with the many budding mathematicians at the camp. This past summer, full-time mathematical sculptor and Zometool expert George Hart spent a week with the campers, staying up until all hours to help them construct elaborate “Zome homes”. Dr. John



Junior Counselor Megan Guichard makes a mathematical fashion statement. Photo by Chris Tuffley.



Junior counselor Dan Zaharopol accompanies a crew of campers down the Kennebec River. Photo by Chris Tuffley.

Conway joined us for a week from Princeton to talk about...well, all things mathematical. His morning lectures covered everything from tangles (demonstrated visually by some volunteer camp-

ers who didn’t mind getting tied up in knots — literally) to the mathematics of rainbows — and that’s without even getting into the dozens of topics that came up while campers had lunch with the camp’s celebrity mathematician.

Other visitors shared their expertise in fields indirectly related to mathematics. University of Cambridge physics postdoctoral fellow Sanjoy Mahajan taught a handful of classes about approaching physics problems through order of magnitude analysis. His other classes, on analysis of data, will ensure that a few dozen students will never read the newspaper in quite the same way again. And Assistant Professor Hany Farid from Dartmouth shared his research and knowledge of image processing and computer vision to some campers who now have reason to wonder what’s behind that digital photograph of Albert Einstein.

But that’s just what goes on during the week — and it’s not even the half of it: a myriad of impromptu games ranging from Capture the Flag to bridge to Scrabble to Ultimate Frisbee peppered the Colby campus for the duration of the camp. Weekends (Sunday and Monday at Mathcamp) are reserved for nonmathematical fun, and this year we took full advantage of the beauty of Maine. One Monday found us whitewater rafting (and, in some cases, swimming) in the Kennebec river, and another was spent at Acadia National Park, where campers could choose to go kayaking, hiking, or biking. One camper, Jennifer Sheppard of Beaumont, Texas, commented to me at the Kennebec: “I’ve spent more time outdoors this summer than I ever have before.” Indeed, this ain’t your parents’ math class — or even yours.

Sadly, all good things must come to an end. (Some, however, beg to differ — at one of Julian Gilbey’s classes, a course dealing with methods of thinking, students brainstormed over the pros and

cons of having a *year-long* Mathcamp.) The final days of the camp are a high-adrenaline variant upon what the campers have come to experience during the first several weeks. Far from tiring of math, they do even more of it during the entire last night of camp, which features showings of math movies (this year's fare was the off-Broadway musical *Fermat's Last Tango*), additional math talks (including one on David Savitt's thesis, which he presented in response to some students' requests for "math talks [we] don't understand at all!" — rumour has it these students weren't let down), and a Mathcamp tradition — 30 proofs in 30 minutes (we managed 36, one of which was a thorough — modulo a couple of lemmas — proof of Fermat's Last Theorem). There's no requirement that the annual end of camp talent show involve

math, but even then we can't resist. This year, a posse of campers presented a delightful skit about the camp, and I opted for the second year to take advantage of the only audience that would ever appreciate *The House With Too Many Perpendiculars*, a skit I wrote about a family living in a four-dimensional house.

Indeed, I, like the girl in the *Seventeen* ad, would rather go to Mathcamp than smoke a joint. But regardless of how well that anti-drug tack resonated with most young adults, I'm afraid that it sells Mathcamp woefully short. Camper Chintan Hossain of Wilmington, Delaware, described the camp as "by far the best five weeks" of his life — and it's a sentiment echoed year after year by campers who insist that there's *nothing* they'd rather do than go to Mathcamp.

Personally, I've experienced no greater high than talking about conics in the projective plane to teenagers who can catch my enthusiasm — and I'll be returning in 2002 to get my yearly fix. ■

Brenda Fine is a graduate student in algebraic geometry at the University of British Columbia, and is counting the days until next year's Mathcamp.

For more information about Mathcamp, visit their web site at <http://www.mathcamp.org> or contact the organizers by email at info@mathcamp.org.

Mathematics and Democracy in Nigeria

On July 20, 2001, Professor Jacqueline Brannon Giles visited Nigeria to present a paper entitled *Mathematics and Democracy: the Case for Quantitative Literacy in the United States and Nigeria (A Comparative Study)*. As a member of the MAA Quantitative Literacy Committee and MAA Board Member for Minority Affairs, she received a copy of *Mathematics and Democracy*, published by the National Council on Education and the Disciplines. She immediately recognized the importance of extending the discussion of quantitative literacy to the global community, especially in Nigeria.

Nigeria was targeted in her discussion because of the large number of Nigerians in the United States who regularly travel back and forth to Nigeria to contribute to the nascent democracy established in May, 1999 under the administration of Nigeria's current President Olusegun Obasanjo. Professor Giles had attended the "Handover to Democracy" ceremony and the inauguration of President Obasanjo in 1999, and so was familiar with the Nigerian situation.

Professor Giles emphasized issues that should be discussed nationally and internationally. These included the importance of sensitivity to the cultural and contextual situations arising in Nigeria (and other countries) in the process of constructing a sound definition of "literacy" and "quantitative literacy" in Nigeria (and other countries.)

She further stated in her presentation that more student exchange programs should be established and that workshops, forums, and conferences on quantitative literacy should be implemented in the United States and other countries who are in cooperative relationships with the



Professor Giles with Dr. Jerry Kolo (left), president of the Council of Nigerian People and Organizations (CONPO), headquartered in Florida, and Chief (Prof.) Adebayo Mokuolu, member of Council of Obafemi Awolowo University, Ile-Ife, Nigeria.



Professor Giles with Mrs. Pauline K. Tallen, Honorable Minister of State, Federal Ministry of Science and Technology, Nigeria. Mrs. Tallen arranged for the CONPO delegates to attend church with President Obasanjo and to have a two-hour dinner meeting with him to discuss educational issues.

United States. She believes that programs in quantitative literacy offer opportunities to develop human resources and to demonstrate commitment and compassion for all sectors of our communities.

While in Nigeria in July 2001, she revisited Ushafa Land in Abuja, Nigeria and was named Gimbiya (Princess) of Ushafa Land, by the Chief of the village. Professor Giles had visited Ushafa earlier, at the time of former President Clinton's visit to the region in August 2000. Having been named Gimbiya, she was asked to serve as a liaison to former President Clinton to pursue the opportunity to establish an Institute of Mathematics and Technology in the Nigerian village. On October 5, 2001, Clinton's office indicated that he was incredibly busy now, and that Professor Giles should contact his office in January to make an appointment to see him to discuss the Chief's proposal.

The International Guardian, a journal for Africa and America, published a large portion of Professor Giles's talk. The response to the article in the mathematics community has been extensive and favorable, indicating our interest in not only national but also international concerns.

Have You Moved?

The MAA makes it easy to change your address. Please inform the MAA Service Center about your change of address by using the electronic combined membership list at MAA Online (www.maa.org) or call (800) 331-1622, fax (301) 206-9789, email: maaservice@maa.org, or mail to MAA, PO Box 90973, Washington, DC 20090.

MAA Awarded Half Million Dollar NSF Grant to Support Assessment

The MAA has been awarded a \$499,928 grant by the National Science Foundation (NSF) for a three-year project entitled *Supporting Assessment in Undergraduate Mathematics*. The project's products will include a workshop series, a volume of case studies and syntheses of case studies on assessment, and a web site for information about assessment.

The objective of the project is to support faculty members and departments in efforts to assess student learning in at least one of the following: (1) Coherent blocks of courses of undergraduate mathematical sciences, including entire degree programs; and (2) Individual courses, especially reform courses, using various assessment tools across varieties of institutions.

The targeted blocks of courses are: (a) the major in mathematics, (b) courses for future teachers; (c) school mathematics as a preparation for college mathematics, usually called college placement programs; and (d) general education courses, including those aimed at quantitative literacy. This latter block will include study of assessments of the mathematical and quantitative literacy achieved in entire degree programs, recognizing that much mathematics is learned outside mathematics courses.

Assessing learning in individual courses across a variety of institutions will focus on reform courses and include study of classroom assessment. Cycles that use assessment for program improvements will be of special interest, including those that use research in learning.

Bernard L. Madison (MAA Visiting Mathematician from the University of Arkansas), who wrote the proposal, is the Project Director. Senior personnel are Bonnie Gold (Monmouth College), William E. Haver (Virginia Commonwealth University), Sandra Z. Keith (St. Cloud State University), William A. Marion, Jr. (Valparaiso University), and Lynn A. Steen (St. Olaf College). Thomas W. Rishel (MAA Associate Executive Direc-

tor) will manage the project at the MAA office. Peter Ewell, an internationally known authority on assessment and evaluation, will serve as Project Evaluator. There is a sub-award to the University of Arkansas to support Madison's work there.

The award fits into the NSF program on Assessment of Student Achievement. This new program is part of NSF's Education and Human Resources division, and this was the first round of proposals. The solicitation attracted 144 proposals, of which only 10 were funded. A second solicitation is now in process. The MAA proposal was strengthened by the organization's record in supporting assessment of student learning. MAA's work began in 1990 with the appointment of the CUPM Subcommittee on Assessment (with Madison as Chair).

In 1995 the Subcommittee issued guidelines for departments to use in establishing a cycle of assessment aimed at program improvement. Marion was a member of the Subcommittee and joined with Gold and Keith to edit *Assessment Practices in Undergraduate Mathematics* (MAA Notes #49), published in 1999. This volume contains over seventy case studies of assessment at institutions across the US and includes the Subcommittee on Assessment's 1995 report as an appendix. Prefaces by Steen and Madison give more history of the MAA's support of assessment. (The book was reviewed in **MAA Online**: see <http://www.maa.org/reviews/assess.html>.)

As a part of the project, this MAA Notes volume will be sent to every US mathematics department within the next few months. The volume and other aspects of this project will be the focus of forums that will be scheduled at MAA Section and other meetings.

Sections wishing to schedule such a session to help support faculty who are working on assessment or planning work on assessment should contact Madison (bmadison@maa.org). The project has



Bernard L. Madison

funds to support the senior personnel to conduct these forums.

Gold, Marion, and Keith will be gathering additional case studies on assessment and updating some of those in *Assessment Practices in Undergraduate Mathematics* to constitute part of a new volume to be submitted for publication in the MAA Notes series. Steen and Madison will be writing syntheses of various coherent groups of case studies for this same volume. Once the new volume is published, it, too, will be mailed to every US mathematics department.

Haver will have principal responsibility for developing a workshop series to support assessment efforts. The first workshop is already scheduled and will be supported by the MAA PREP program, another NSF-funded activity. This workshop is an extended version, aimed at having 10 to 12 institutional teams working jointly on assessment efforts over two years.

The workshop will begin with a two-day session following the Joint Mathematics Meetings at San Diego in January 2002 and end with a session at the close of the Joint Mathematics Meetings in Baltimore in January 2003. Gold, Marion, Keith, and Madison will assist Haver in conducting this workshop. Support for travel, housing, and food is available. More information can be found at **MAA Online** under Professional Development (<http://www.maa.org/pfdev/prep/prep.html>). ■

Assessment at the Department Level

William Haver, Bonnie Gold, Sandra Keith, William Marion and Bernard Madison
January, 2002-November, 2003

This workshop has four components, spanning a time frame of 24 months.

January 10 & 11, 2002-Embassy Suites, San Diego, CA

May 22-25, 2002-Virginia Commonwealth University, Richmond, VA

January 19 & 20, 2003-Convention Hotel, Baltimore, MD

November 2001-2003-On-going, online consultation and communication

This workshop series is a continuing education program to help teams of two faculty members lead their departments in the conceptualization, formulation, and implementation of assessment of some component of their academic programs. Participants will be provided with ongoing support and consultation throughout the entire process.

If you are interested in learning what is known about assessment in mathematics programs, carrying out an assessment program and then contributing to the assessment knowledge base of the mathematics community, this workshop is for you.

There is no fee to attend the workshop. All meals and workshop materials are paid for by the MAA with support from the NSF. Participants are responsible for making their own travel arrangements and are asked to save original receipts for reimbursement.

For questions about this workshop, please contact Tom Rishel at trishel@maa.org or visit <http://www.maa.org/pfdev/prep/haver.html>.

Short Takes

Functions, Models and Data

This NSF summer institute, to be held on June 19-June 24, 2002 at Dickinson College in Carlisle PA, is based on the new *Workshop Precalculus* materials developed by Nancy Baxter Hastings (Dickinson College) and Allan Rossman (formerly of Dickinson College, now at California Polytechnic State University San Luis Obispo). Its goal is to prepare participants to utilize the interactive teaching techniques and innovative technology that characterize the workshop approach. It will provide them with the necessary background and support to adapt the Workshop Precalculus materials for use in their own environments.

Faculty from high schools, community colleges, four-year colleges, and universities are encouraged to apply. An application is available on the web at <http://calc.dickinson.edu/SummerInstitute>, or contact Joanne R. Weissman at weissman@dickinson.edu. Electronic submission of applications is encouraged.

Carole Lacampagne Named Director of MSEB

Carole Lacampagne has been chosen as the new director of the Mathematical Sciences Education Board (MSEB), which is affiliated with the Center for Education of the National Research Council. Lacampagne comes to MSEB from the RAND Corporation, where she was working as a senior researcher on loan from the U. S. Department of Education. At the U.S. Department of Education, she directed the National Institute for Postsecondary Education. For more information on MSEB, visit their website at <http://www4.nationalacademies.org/dbasse/mseb.nsf/web/homepage?OpenDocument>.

Not Ready For College

A report released in October by the *National Commission on the High-School Senior Year* concludes that high schools are failing to prepare many of their students for college. Only half of those students who enroll at four-year colleges succeed in obtaining a degree, largely, according to the report, because these students are inadequately prepared for the rigors of college academics. The report, entitled "Raising Our Sights: No High School Senior Left Behind," recommends a major restructuring of the high-school curriculum and better coordination between high school and college. Copies of the report are available online at <http://www.commissiononthesenioryear.org>.

JOMA Panel Session in San Diego

The MAA's new *Journal of Online Mathematics and its Applications* (JOMA) is now a year old. We will celebrate this event at the Joint Meetings in San Diego with a panel session featuring JOMA authors discussing their JOMA materials and their work in general. Members of the panel include:

- Dennis DeTurck, University of Pennsylvania
- John Kiltinen, Northern Michigan University
- Tom Leathrum, Jacksonville State University.

The session will be introduced and moderated by JOMA editor David Smith (Duke University). The session will be held on Monday, January 7, 9:00 a.m.-10:30 a.m. The JOMA web site is <http://www.joma.org>. This session has been organized by Lang Moore (MAA and Duke University), Executive Editor of the *Mathematical Sciences Digital Library* (MathDL).

San Diego Program Updates

MAA Sessions

JOMA Authors Present

Monday, 9:00 a.m. – 10:30 a.m.
Organized by David Smith
Duke University and Lang Moore
MAA and Duke University

After an introduction by the editor of the Journal of Online Mathematics and Its Applications (JOMA), authors who have published in JOMA will talk about their materials and their work in general. Authors include David Smith, Duke University, Tom Leathrum, Jacksonville State University, and John Kiltinen, Northern Michigan University.

Course Portfolios and the Scholarship of Teaching and Learning

Sunday, 4:15 pm – 5:45 pm
Organized by Thomas Banchoff
Brown University

A course portfolio is “a form of scholarly inquiry and communication through which we can represent and exchange the scholarship of teaching” (Shulman 1998). In this session, panelists who have all been participants in the Carnegie Academy for Teaching and Learning will discuss how course portfolios might be most profitably used in the discipline of mathematics.

The presentations will be illustrated by portfolios in progress. Discussion will follow. Panelists for the session include Bruce Cooperstein, University of California; Santa Cruz. Curtis Bennett, Bowling Green State University; Anita Salem, Rockhurst University; and John Holcomb, Cleveland State University

The Global Classroom: Live E-Learning Over the Web

Tuesday, 9:00 a.m. – 10:30 a.m.
Organized by Marcelle Bessman
Jacksonville University and Douglas A. Quinney, Keele University, UK

The Global Classroom is a “classroom without walls” that supports interaction between students and a “visiting” scholar

and among students all gathered in a “classroom” on a virtual campus that resides on a server. It supports synchronous, collaborative use of common software packages including Mathematica, Maple and various commonly used software packages, such as word processors and spreadsheets via the Web. Control of a software package opened on one machine can be passed to a person at another machine in another room or even another geographic location. This campus supports audio connectivity in a cooperative learning environment. Sessions can be recorded for review of the session by students or for study by students who missed the session. We will describe the Global Classroom project and demonstrate the interconnectivity and collaboration over the internet. In addition, participants will learn how to develop their own online teaching material.

The Mathematical Education of Teachers

Tuesday, 1:00 p.m. - 2:30 p.m.
Organized by Ron Rosier, CBMS

“The Mathematical Education of Teachers,” published last August by the AMS and the MAA, calls for mathematics faculty to take a more active role in the preparation of future teachers of mathematics at all levels. Two themes guide the MET document: 1) the intellectual substance in school mathematics, and 2) the special nature of mathematical knowledge needed for teaching.

This session will focus upon how faculty can use the document to develop courses that can provide future teachers with a deeper understanding. The speakers will include: James Lewis, University of Nebraska; Alan Tucker, SUNY Stony Brook; and Glenda Lappan, University of Michigan.

How to Successfully Publish a Textbook

Wednesday, 1:00 pm – 2:30 p.m.
Organized by Michael R. Lennie
San Diego, CA

Michael Lennie will cover the essentials

of how to write a winning proposal and contract essentials. He will cover the tricks of the trade describing how to present your textbook in its best possible light in the Proposal. You'll learn techniques for selling your acquisitions editor with a clear description of the text, its features, and ancillaries.

Michael Sullivan, Lemont, IL, will describe how to assure a successful review process and discuss the similar yet distinct pre-contract review, developmental review, and post-publication review from the unique position of the mathematics author.

Robert Christophererson, American River College, will discuss the discipline of writing a textbook and what you must know about the publication process. He will explain why setting up a “writing studio,” preparing the outline, style guides, and tracking logs are critical elements to creation of a successful manuscript. He will discuss research and writing, production of manuscript and art, and the publishing process, including developmental editing, book design, and marketing. Each presentation will be followed by questions and answers and will include handouts.

AMS–MAA Joint Session

Professors for the Future Programs

Wednesday, 9:00 a.m. – 10:30 a.m.
Organized by Samuel M. Rankin, AMS
and Tom Rishel, MAA

Various graduate student development and training programs, often described as Professors for the Future, have come into existence at institutions across the country. One of these is funded by the NSF and administered through the AMS and MAA.

In this panel, directors of both the NSF-funded and some of the separately-funded programs will discuss their activities, looking at what works and what doesn't, and concentrating on the effects they are seeing on the continuing careers of their students.

Presentations by Recipients of the Haimo Teaching Awards

Tuesday, 3:30 p.m. – 5:00 p.m.
Room 6C of the San Diego
Convention Center

Polymath Teaching

Dennis DeTurck
University of Pennsylvania

College and University teaching in general, and mathematics teaching in particular, faces many challenges and opportunities. We teach individual and small groups of students who share our enthusiasm for our subject, larger groups of widely varying aptitude and inclination, and a public that is increasingly consumer-oriented, but largely ignorant about our subject and how it is practiced and taught. Information technology has changed both what we teach and how we interact with our students.



Dennis DeTurck

Given the range of tasks that faces the profession, our departments, and us as individuals, and the pace at which the environment is changing, it is remarkable how well the “tried and true” curricular and pedagogical strategies continue to serve. We’ll examine many of these, and see that some things never change, while others need only slight adjustment and “dusting off” to be at least as effective as ever.

Pharmacokinetics

Edward L. Spitznagel, Jr.
Washington University (St. Louis)

Pharmacokinetics is a wonderfully rich source of examples for teaching calculus, statistics, and differential equations, which I have been using in my courses for almost ten years. I will begin by showing the his-



Edward L. Spitznagel, Jr.

tory of a small oral dose of caffeine, equivalent to half a cup of regular coffee, as its concentration rises and falls in the bloodstream. This will lead to the statistics of generic drug testing, planning a dosing schedule to achieve steady-state level of a drug, and differential equations models, all of which are interesting, real-world applications of first and second year college mathematics.

Teaching Up and Down the Mathematical Ladder

Paul J. Sally, Jr., University of Chicago

We will talk about topics in mathematics which stretch through the K-16 curriculum like ropes (not strands). Too often connections among different levels of mathematics are missed. We discuss some of these connections.

SIGMAA on RUME Session Speaker

How Can Mathematical Concepts Be Learned?

Synthesizing APOS Theory and Mathematical Formalism to Get One Possible Answer

Ed Dubinsky, Cincinnati, OH
Tuesday, 5:00 p.m. - 5:45 p.m.

How can a student, on hearing, reading or working with a mathematical concept, come to understand it? There seems to be general agreement that whatever the answer, it involves some kind of idea or mental structure, an image that was not previously present but must develop in the student’s mind. There is considerably less agreement about the nature of such images and how they get into one’s mind. In this talk I will consider some answers to this question that have been proposed, such as metaphors, natural language, representations and contrast them with APOS Theory. Then I will describe how APOS Theory can be combined with mathematical formalism to not only describe how difficult mathematical concepts, such as uniform vs. pointwise convergence of a sequence of functions, can be learned, but also to help students learn such concepts.

MAA Short Course A Sampler of Applications of Graph Theory

This short course, organized by Fred Roberts of Rutgers University, will survey a variety of applications of graph theory. Graph theory is an old subject which has found a vast number of exciting applications in recent years. The speakers will introduce the graph-theoretical topics needed, describe both historical and current applications, and discuss current research topics in graph theory related to the applications. Many of the topics to be covered will be amenable to discussion in the classroom as well as making for good research topics for both researchers and students. No prior knowledge of graph theory will be required.

Short Course Program:

Applications to Network Visualization

Nathaniel Dean, Rice University

Graphs are commonly used to model systems of discrete objects and to visualize these systems by exploiting technology and human visual psychology. We present several approaches to drawing graphs, some computer tools for visualizing the graphs in the plane and higher dimensions, and we explain some of the difficulties associated with constructing good drawings.

Graph Structure on the World Wide Web

Sridhar Rajagopalan, IBM Almaden

In this module, we will look at the web as a graph (pages are nodes, weblinks are edges) from three points of view. In the first section, we will detail various experimental studies to estimate macroscopic parameters of the web graph. We will compare our estimates to the parameter values expected in typical (random) graphs. In the second section, we will talk about new random graph models for generating large random web like graphs.

Finally, we will talk about algorithms which process the web graph for the purpose of searching and data mining. The module is meant to be an introduction to a new and emerging research area, but is not comprehensive. Therefore, we will conclude with some pointers to follow for information not covered in the talk.

Applications of Graph Theory to Molecular Biology

R. Ravi, Carnegie Mellon University

In this talk, we will survey key concepts from graph theory that have found important applications in algorithms for problems arising in Molecular Biology. Key topics covered will include (1) exploiting the graph structure in dynamic programming applications for optimal alignment of DNA and RNA sequences, (2) graph-theoretic ideas arising in the various formulations of multiple sequence alignment problems, (3) the use of Interval graphs in applications to problems in the Physical Mapping of genomes, (4) the importance of the notion of additive and ultrametrics in the realm of phylogenetic reconstruction, and time permitting (5) the use of sophisticated graph-theoretic structures in deriving polynomial-time algorithms for deciphering the minimum genome rearrangement distance between two organisms. We will assume no prior knowledge of Molecular Biology.

Graphs in the Theory of Location of Facilities

K. Brooks Reid

California State University, San Marcos

The theory of location of facilities in networks combines tools from graph theory, basic analysis, optimization, and complexity theory. The central issue is the study of the optimal location(s) of a facility such as emergency installation, a supply depot, a switching center, a pumping station, an obnoxious dump, a communications center, or the like in a network such as a street or road network, an electrical network, a network of channels or pipes, a communications network or the like.

Optimality depends on criteria usually involving some idea of distance and varies according to the application. Weighted graphs provide a context for studying these types of problems, where vertices and edges are assigned weights representing certain parameters according to the application. Usually, special sets of vertices are sought that are either “central” or “peripheral.” Results range from the descriptions of optimal locations to the computational difficulty in actually determining these optimal locations. Considerable study has been focused on weighted trees. These issues have motivated graph theorists to probe many different notions of centrality and notions of the “outer fringes” in ordinary (unweighted) graphs, particularly trees. In such models, users and facility locations are thought to be restricted to vertices. However, the graph theoretical origins of centrality precede the advent of modern location theory as C. Jordan introduced the concepts of the center of a tree and the branch weight centroid of a tree in 1868.

In the main part of this talk we will suggest answers to the question: “Where is the center of a tree?” We will start with a novel treatment of the two classical central sets, the center and the branch weight centroid. Then we will treat in turn other notions and their relationships including the median, the security center, the telephone center, the accretion center, the set of weight balanced vertices, and the latency center. In contrast to these notions, we will consider the distance balanced vertices. Several other central sets will be briefly mentioned, some of which make sense in the class of all (connected) graphs.

Finally, we will mention some one-parameter and two-parameter families of central sets of vertices in trees. In some instances we will discuss these concepts for general networks where, in some instances, users and facility locations can be placed not only at vertices but also at points along edges.

One goal of this talk is to convey the idea that this subject is a very accessible branch

of applicable combinatorics, rich in problems, and offering an occasional surprise.

Graph Theory and Social Networks

Fred S. Roberts, Rutgers University

Graph theory has many applications in the study of social networks, networks whose vertices are people and whose edges represent some relationships between individuals. Applications include graph coloring models to help define the “social roles” of individuals; signed and marked graph models to help define “balance” and “social justice” in small group situations; models of the spread of opinions from person to person; and models describing the structure of acquaintances and the influence of some people on others. Social networks are also increasingly important in the study of infectious diseases, like AIDS, that are spread through social contact. We shall describe such applications of graph theory and the fascinating graph-theoretical concepts and problems that arise in such applications.

Applications to Statistical Physics

Peter Winkler, Bell Labs

Statistical physicists would like to understand how local rules for a many-part system can cause qualitative changes, called “phase transitions”, in the global behavior of the system. How can graph theory help?

Sometimes the local rules are what we call hard constraints, which might, for example, forbid two particles to occupy neighboring sites in a grid. Such rules can be formulated graph-theoretically, and indeed the resulting systems often correspond to familiar constructions like colorings and independent sets.

We will take a little tour through the graph theory of hard constraints, visiting fertile graphs and dismantlable graphs on the way to some combinatorial understanding of the notion of phase transition.

Read This!

Recently Reviewed on MAA Online

The MAA Online book review column is still going strong. We now have over 200 book reviews and brief notices online. The latest reviews are featured at the main *Read This!* page at <http://www.maa.org/reviews/reviews.html>. Recently reviewed books include:

Teaching First, by Thomas W. Rishel
When Topology Meets Chemistry, By Erica Flapan
Symmetry, by Hans Walser
George Green: Mathematician and Physicist, 1793 - 1841, By D. M. Cannell
Mistakes, by Barry Cipra
Stamping Through Mathematics, By Robin Wilson
Mathematical Reminiscences, By Howard Eves
Drawbridge Up, By Hans Magnus Enzensberger
Computers, Ltd., By David Harel
The Fermat Diary, By C. J. Mozzochi
Mathematical Perspectives on Theoretical Physics, By Nirmala Prakash
Identification Numbers and Check Digit Schemes, By Joseph Kirtland
The Geometry of Numbers, By C. D. Olds, Anneli Lax, and Giuliana Davidoff
The Mathematics of Soap Films, By John Oprea
Mathematical Olympiads 1998–1999, By Titu Andreescu and Zuming Feng
The Shape of the Great Pyramid, By Roger Herz-Fischler
Flatterland, By Ian Stewart
Chaotic Elections!, by Donald G. Saari
The Math Gene, By Keith Devlin
The Sand Reckoner, By Gillian Bradshaw

Letter to the Editor

As a believer in partial credit, I have never found a satisfactory way to grade the student who makes an error at the beginning of a problem that converts it to a much simpler problem.

Suppose that the student has solved the simpler problem correctly. In the interest of fairness, what penalty if any should be imposed on the solution by virtue of the student's having escaped the problem that was intended?

I would be interested in hearing readers' reactions.

Sincerely,
 Jay Beder
 Department of Mathematical Sciences
 University of Wisconsin-Milwaukee
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Reshaping Graduate Education: Looking Back at the Wisdom of Mina Rees

By Amy Shell

Mina Rees (1902-1997) is most widely known for her work on the development of the computer in the early 1950s. As head of the Mathematical Sciences Division of the Office of Naval Research following World War II, Rees' funding policies helped guide research in computing, as well as research in mathematics and the mathematical sciences, at universities across the country. What most people outside of the City University of New York (CUNY) system do not know is that after leaving the high-powered world of grant administration, Rees returned to academia to participate in launching CUNY.

As the founding president of the Graduate School and University Center at CUNY, Rees had a profound effect on graduate work there. Her involvement in research and education as a member of both the National Science Board and the National Science Foundation Board and her tenure as the first female president of the American Association for the Advancement of Science made her an experienced and influential voice on educational policy in the 1960s and 1970s.

During those years Rees was an outspoken advocate for the reform of graduate education. Thirty years after her 1972 retirement from the helm of the Graduate School and University Center, her wisdom and insight into the policies and programs of graduate education deserve a second look.

A native New Yorker, Mina Rees attended Hunter College High School for girls and Hunter College for women in Manhattan. When she graduated from Hunter College in 1923, she was asked to join the faculty. Believing she did not have the mathematical background to be a good college instructor, she taught at Hunter High School while attending Columbia University as a full-time graduate student in mathematics. Rees intended to pursue

a doctorate in mathematics. At that time, however, Columbia was not interested in having female doctoral students. Thus, in 1925 she completed her master's degree at Columbia in mathematics education and started lecturing at Hunter College. Four years later, she took a leave of absence from Hunter to pursue her Ph.D. She headed to the University of Chicago and completed her doctorate in December 1931 with a thesis in associative division algebras under the guidance of Leonard Eugene Dickson.

Rees returned Hunter College, where she was promoted to Assistant Professor in 1932, and then to Associate Professor in 1940. At the start of World War II, Richard Courant suggested to Warren Weaver of the government's Applied Mathematics Panel that Rees be made Weaver's assistant and Technical Aide to the Panel. Her role was to be the liaison between the government and the university research groups contracted by the panel to do research related to the war.

At the close of World War II, Rees was appointed to head the Mathematics Branch of the newly formed Office of Naval Research (ONR) in Washington, D.C. Rees' 1952 appointment as Deputy Science Director of ONR allowed her to make policy and funding decisions that greatly influenced scientific and mathematical research in the U.S. For example, prior to the ONR, most funding went to the institution and then on to the researcher, with little or no money for graduate students. Rees changed this, awarding grants to individual researchers and supporting their students. From the early 1950s through the 1960s, ONR was the largest source of funding for academic research in the sciences.

In 1953, Rees left ONR to return to Hunter College as Professor of Mathematics and Dean of Faculty. In the spring of 1961, the New York State Legislature



Mina Rees

and Governor Nelson Rockefeller approved the establishment of The City University of New York. CUNY originally consisted of the five senior colleges of New York City: City College, Hunter, Brooklyn, Queens, and Lehman, along with three of the city's junior colleges. The consortium style permitted greater flexibility, allowing CUNY to meet the unique needs of the city.

The first chancellor of CUNY, John Everett, appointed Rees as the first Dean of Graduate Studies effective September 1961. Rees comments that

*The experience in Washington had given me administrative and academic sophistication that would have been hard to get elsewhere ... the importance of the ONR experience was in the rather intimate knowledge it gave me of the modus operandi and of the ambience of virtually all of the country's leading research universities and of many of the liberal arts colleges.*¹

She was the first female dean of a co-educational graduate school in the United States. Her challenge would be to bring together a high quality faculty to serve both the new graduate programs and the

¹ Rees, Mina, Biographical letter, *Association for Women in Mathematics Newsletter*, 9, July/August 1979, pp. 15-18.

undergraduate colleges, design the graduate programs, and create new facilities. The program for the dedication of the Mina Rees Library at CUNY in 1985 states that for the eleven years Rees was at CUNY, she “provided the leadership, inspiration, and guidance for the development of doctoral work” at CUNY.

Rees went on to become provost of the Graduate Division in 1968 and then the first president of the Graduate School and University Center (GSUC) of CUNY in 1969. Originally the graduate school had only four programs. By the time of Rees’ retirement, 26 doctoral programs were in place and 477 Ph.D.s had been awarded.

At the time Rees returned to academia in 1953, the nation was poised on the threshold of profound social, technological, industrial, and economic change. The technological advances made during World War II, the need for scientists, engineers, and teachers, along with the birth of the computer age, changed the focus of undergraduate and graduate programs. The jump in enrollment in general, and of women and minorities in particular, stressed a system that had been historically slow to change. As the 1950s led into the 1960s social and environmental issues grew in importance. All this caused educational norms to begin to shift to reflect this new focus.

Rees was keenly aware of the changes taking place, and advocated educational reform to meet not only new demands, but also new social concerns.

What, indeed, is graduate education for? Is it for getting a job? For providing the understanding out of which criticism of our social goals and national actions can be built? Is it for pushing back the boundaries of knowledge and decreasing the areas of ignorance? Or is it, perhaps, for the glory of the human spirit? Is it for the student? For the faculty? Or for society?...²

Rees faced these new issues squarely and posed tough questions to the educational community.

Can the university in the years ahead serve the human needs of all our people in their search for human dignity? Can it maintain our belief in the power of scholarship to improve our understanding of our neighbors and ourselves? Can it restore our confidence that the unbiased and competent study of society by trained and dedicated men and women can fashion for us the tools that can assist us in improving society? Can it provide a means for some students and some members of the faculty to gain experience at the university with research on outstanding social problems, with a view not only to gaining greater insight but also



Mina Rees with Ed Begle, 1960.

to proposing possible solutions based on careful research and critical discussions?³

Rees held high expectations for the future of graduate education. She saw graduate education in a larger context,

with overarching social as well as educational and scholarly purposes.

I would hold that a continuing major function of the university in the United States is to support and strengthen the kind of inquiry into nature which can be pursued chiefly from a motivation to understand the world and the people in it. ... Though I subscribe to these statements as a formulation of one of the major functions of the university, it is important to recognize that in this vast and varied country of ours there are many functions to be served and diverse clienteles to be educated, and it would serve us ill if all our universities set for themselves the same purpose, the same organizational patterns, and the same campus ambience.

To answer her own questions, Rees advocated that graduate education be vitally linked to industry, tackling the problems of a modern society. She counseled educators to actively engage their students in intellectual pursuits that would further their profession and its relationship to society. Above all, Rees envisioned a future for academia in which the solving of social problems was of prime importance to every student, faculty member, and department. She hoped to bring academics out of the ‘ivory tower’ and into valuable contact with the issues of the day.

If we are to address ourselves to some of our outstanding national problems such as a drastic reordering of our patterns of production, a redesign of our modes of consumption, the rehabilitation of our core cities and our ghettos, and the solution of our myriad other urban and rural problems, there are opportunities for local specialization in thesis research and in design of programs that can call on the resources of the university and at the same time exploit the interest and the vigor of our student population.⁴

² Rees, Mina, Graduate Education—A Long Look, *Graduate Education Today and Tomorrow*, University of New Mexico Press, 1972, 130-151.

³ Rees, Mina, The Ivory Tower and the Marketplace, *On the Meaning of the University*, University of Utah Press, 1976, pp. 81-101.

⁴ The remaining quotes are taken from footnote 1.

At CUNY Rees developed programs in cooperation with industry, city government, and cultural institutions to train CUNY's students to effectively meet the needs of New York City. Though she believed graduate education should be specialized, she strongly protected the undergraduate curriculum from premature specialization.

Rees also worked to build graduate programs that meet not only the needs of society, but of the student.

Graduate education, in the American style, embraces both course work that is aimed at bringing the student to an understanding of the conceptual structure of his field at the frontier, and research that is aimed to push the frontier a little further. ... We need to distinguish between the role of the graduate school vis-a-vis those students whose immediate goals are concerned primarily with pushing back the frontiers of knowledge, those whose concerns are with understanding and criticizing society from the vantage point of the university, and those who aspire to enter society as practitioners preparing to address themselves immediately to pressing social problems.

For example, she set in place programs to help returning students, especially women and minorities, back into academic life.

As the president of GSUC, Rees set the standards for the institution, which encompassed all facets of the graduate program. One of Rees' hallmarks was the implementation of non-traditional programs with emphasis on internships and interdisciplinary work. Frances D. Horowitz, President of GSUC at the time of Rees' death, stated in a memorial that "Mina Rees's understanding of what it means to do quality graduate education set the founding base for the City University Graduate School — a base upon which it was possible to build to the eminence that the GSUC now enjoys."

Rees' work to better graduate education, along with her work in the Office of Naval Research, earned her the Mathematical Association of America's first Award for Distinguished Service to Mathematics in 1962, and the National Academy of Sciences Public Welfare Medal in 1983.

The graduate program at the City University of New York was her testing ground, and her efforts on the national level were practical, timely, and informed. Though thirty years have passed since Mina Rees left the City University of New York, legacy remains. Through her words and presence, she forced her colleagues to look to the future of education, not the past. "Can we have excellence and equality or must we chose between them?" ■

Amy E. Shell is Assistant Professor in the Department of Mathematical Sciences at the United States Military Academy, West Point, New York. She received her B.S.Ed. from the University of Michigan in 1989, her M.A. from Oakland University in 1995, and her D.A. from the University of Illinois at Chicago in 2000. Her dissertation was a historical piece on mathematician Mina Rees, and her current research, conducted with Fred Rickey, focuses on the history of the Department of Mathematical Sciences at USMA.