

Tangents

News from the Department of Mathematical Sciences
University of Massachusetts Lowell

Fall 2009

2009 Alumni-Awards Banquet

Next Banquet set for May 7, 2010

The 2009 Alumni-Awards Banquet was held at the Olympia Restaurant on May 1. Attendees included Dean Tamarin, alumni, students, and faculty. Attendees came to wine, dine and congratulate our 2009 scholarship winners. Each award winner was given a book prize and certificate in addition to a stipend. The following awards were announced.

- Outstanding Graduate Student: Fei Zou
- Mary Hall Prize winner: David Cote
- Richardson-Bedell Scholar: Jacob Fenwick
- Bernie and Yana Shapiro Scholar: Brendan DeCourcy
- Arthur Zamanakos Scholars: Corey Cheever, Bryan Crompton, and Thomas Harrington

In addition, the 2009 MCM Modeling Team was recognized. Members included Marco Bonett-Matiz, Bryan Crompton and Alexander Frieden.

The 2010 Alumni Reception/Awards Banquet will be on May 7 at the UMass Lowell Inn & Conference Center on 50 Warren St., Lowell. All alumni are welcome to attend. Visit <http://faculty.uml.edu/math> for details.



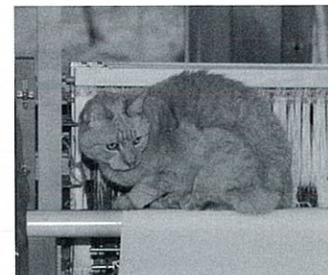
Steve Pennell, Yana Shapiro, Brendan DeCourcy, and Bernie Shapiro



Steve Pennell, Jacob Fenwick, Russ and Mary Bedell

Weaving Mathematics

Prof. Shelley Rasmussen has found time in her busy schedule as coordinator of the undergraduate math major program to turn her hobby into a mathematics research project. In this issue, she gives us an overview of her work.

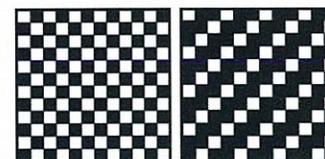


"Permutations nearly killed the kitty, but satisfaction left her sitting pretty."

Many of you will recall some kind of weaving project you completed as a child. It may have been a decorative hanging, a placemat or a potholder, but it probably involved an ancient and useful fabric structure called tabby or plain weave. You had some strands of yarn, string or thread held in parallel under tension; weavers call this the warp. Then you took another length of yarn (called the weft) and interlaced it with the warp threads, over one and under the next, over one and under the next, and so on. In each subsequent row, you laced over any warp threads you went under in the previous row and under any warp threads you previously went over.

Weavers use a diagram called a draft to illustrate fabric structure. Such a draft is a rectangular array of black and white squares—black indicates that the weft thread went under the warp and white indicates the opposite. (And yes, if you turn the fabric over, the colors switch.) The first black and white draft shown, illustrating the

plain weave fabric structure, looks like a checkerboard. Other structures have different looks. Suppose for the first row of a fabric, you weave under two warp threads and over the next, under two and over one, and so on. For each subsequent row, you shift the "over/under" pattern of the previous row one step to the left. The result is the twill structure shown in the second black and white draft; this is the structure used in your favorite pair of jeans.



plain weave

3-harness twill

Modern looms have harness mechanisms that facilitate the weaving process. Subsets of warp yarns (that partition the warp) are assigned to harnesses, one subset per harness. Each warp yarn is threaded through its

Continued on page 2

Once again it has been a busy time in the math department. Enrollment at the university is up substantially, so we are offering more courses, and we are fortunate to have several new adjunct faculty members on board. As usual, there are many people to congratulate.

Among the faculty, Sasha Kheifets was awarded tenure last summer, and Alex Olsen was promoted to the rank of Professor.

Alex was also the Division of Science recipient of the Student Government Association's Exceeding Expectations Award for his outstanding teaching. Congratulations, Sasha and Alex.

Speaking of outstanding teaching, congratulations to Charlie Byrne and Ashot Shahinian, the 2009 winners of the Department of Mathematical Sciences Teaching Excellence Awards.

Congratulations to junior math major Angus MacDonald, who was honored at the National Student-Athlete Day luncheon on April 3 in Alumni Hall for having the highest GPA on the men's cross-country team last fall.

Our spring graduates are Alan Michael Bartlett, Marco de Jesus Bonett-Matiz, Isabelle Jane Chischportich, Alexander Everett Frieden, Matthew Robert Killam, Russell Littlefield, Asha Aliolani Pilai, Anuj Atul Shah, Melissa Anne Spencer, and Paul Michael Tishue. Alan and Alex will be pursuing doctorates in mathematics, and Marco will be pursuing a doctorate in physics. Matt is pursuing his MS degree in our department.

Our summer graduates are Jeffrey J. Agersea, Jonathan Anderson, Tuan Nguyen, and Brendon Delaney Staruk. Brendon is pursuing his MS degree in our department. We are happy to have Matt and Brendon here for a while longer.

I am happy to report that two of our long-time adjunct faculty members have joined the department as full-time visiting assistant professors this year. Zahra Fardmanesh-Karimy is helping Marvin Stick coordinate the math courses for College of Management students, and Chuck Ormsby is coordinating the new Calculus IA/IB sequence.

The Calculus IA/IB sequence, which combines the Calculus I material with relevant precalculus material, is part of an effort to improve the success rate in our first-year courses. Calculus czar Ron Brent, Chuck Ormsby, and Kiwi have led the effort to revamp Calculus I and precalculus. All courses are now taught in individual sections rather than in large lectures, and students can do homework online so they can get instant feedback.

Since 2003, our department has been part of *Focus on Math*, a program funded by the National Science Foundation. According to the project web site (<http://fom2.mspnet.org/>), *Focus on Math* is "a project of NSF's Math and Science Partnership program that engaged Boston University, the Education Development Center, Inc., the University of Massachusetts at Lowell, and an array of Massachusetts public school districts. Since its inception, FoM has sought to improve student achievement in mathematics through programs that provide teachers with solid content-based professional development sustained by 'mathematical learning communities' in which mathematicians, mathematics educators, K-12 administrators, and teachers work together to put mathematics at the core of mathematics education in grades 5-12." An allied project, *Mathematical Experiences* was recently funded by the Massachusetts Department of Education for 2008-11. Thanks and congratulations to Al Doerr, Kiwi, Ken Levasseur, and Marvin Stick for their ongoing participation in this exciting project.

Please keep in touch, and stop in to visit the next time you are in the area. Remember to check out our web site for items of interest.



Steve Pennell

Continued from page 1

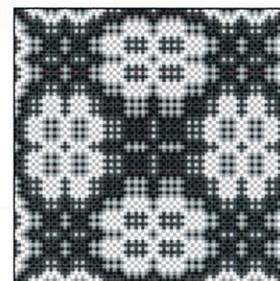
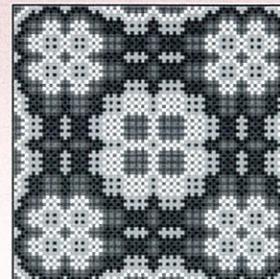
Weaving Mathematics

harness so that when the harness lifts, the warp yarn and all others attached to this harness lift. The weaver passes a weft yarn through the space (called the shed) formed between the warp threads that are lifted and those that are not. The weaver then lifts another harness and repeats. Plain weave requires two harnesses and the denim twill requires three. More complicated fabric structures require more.

Since learning to weave, I was curious about what would happen to the fabric structure if the numbers assigned to harnesses were permuted. Clearly nothing will happen if the order of lifting the harnesses is likewise permuted. But what if the lifting pattern is not changed? A research paper exploring this question is currently under review for publication.

As part of this research, I describe a method of coloring a rectangular array in more than two colors, extending the two-color draft to multiple colors. I am grateful to UML undergraduate mathematics major Jacob Fenwick for writing the Python program that allowed me to create

multiple color designs such as those shown below.



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Now I am looking into other methods of coloring a rectangular array. UML mathematics graduate student Salman Shaikh made additions to Jacob's program that will help me with this research.

Besides the results on coloring the plane, this research has led to a whole class of weaving designs that have not been previously described. I have woven some examples, but have a lot of work still to do.

Steve Pennell, Chair

Writers: Ken Levasseur, Ann Marie Hurley, Dan Klain, Ravi Montenegro, Guntram Mueller (emeritus), Alex Olsen, Raj Prasad (on leave), Jim Propp, Marvin Stick

Tangents is produced biannually by the Publications Office for the Department of Mathematical Sciences. Your comments are welcome.

Fardmanesh-Karimy and Ormsby hired as Visiting Assistant Professors

We are happy to announce that Zahra Fardmanesh-Karimy and Chuck Ormsby have been hired at the position of Visiting Assistant Professors starting in the Fall of 2009. Both Zahra and Chuck have been teaching in the department for a number of years. Their new positions are recognition of a job well done. Congratulations to both of them.

Zahra Fardmanesh-Karimy graduated from UMass Lowell in 2001 with an M.S. in Mathematics with a concentration in Scientific Computing. Since graduation, she has taught Statistics, Management Precalculus and Management Calculus on a part-time basis. This Fall semester she is assistant coordinator of the Management Calculus sequence. Zahra comments that "I have enjoyed UMass Lowell both as a student and as a faculty member. I love teaching and finding ways to connect Mathematics to real life. I enjoy reading nonfiction books, traveling and exploring new cultures."



Zahra Fardmanesh-Karimy

Chuck Ormsby came to the Mathematical Sciences Department as an Adjunct Professor in 2004 after becoming involved in education as a School Committee Member in North Andover, MA. One of his key missions, as a school committee member, was to raise academic outcomes with a particular focus in mathematics. Teaching at UML provided an opportunity to better understand where K-12 mathematics instruction could be improved. After getting his feet wet, he was hooked!



Chuck Ormsby

Prior to coming to UML, Chuck spent thirty years in industry. His first twenty five years were spent at TASC in Reading, MA where he rose to Vice President and served as Division Director of the Sensor Technology, Embedded Digital Systems, and Imaging Technology Divisions. Work in these divisions included analyses of aided inertial navigation systems, development of models for infrared and synthetic aperture radar sensors, design, development and testing of smart weapons, and applications of imaging technology to office automation.

During his last five years in industry, Chuck served as Vice President of Technology Research at Anacomp Corporation where he headed the design, development and deployment of a highly scalable, fault-tolerant, web-based archive for mission critical business documents.

In his spare time, Chuck tends to his three grown children, Charlie, Elizabeth and Andrew, writes a monthly column for the Valley Patriot newspaper and hones his flying skills at Lawrence Airport.

Chuck earned his Bachelor of Sciences degree in Engineering Physics at Cornell University in 1968 and his Ph. D. in Instrumentation at MIT in 1974.

Alumni Update

Patrick Joyce (B. S., 2004) has recently earned his Ph.D. in Statistics from the University of Connecticut and has taken a position with the US Census Bureau.

Michelle Pollister (B. S., 1992) writes "I recently welcomed my second daughter home. Vivian Mae was born 10/24/2008. Her big sister Morgan just turned 4 and is very excited. I'm currently working as an actuary at John Hancock in Boston."

What Are You Up To?

Want to keep your classmates up to date on what you're doing and where you are? Take a few moments to tell

us where you are, and whatever else you might like to share.

We can be contacted by mail at Department of Mathematical Sciences, North Campus, UMass Lowell, Lowell MA 01854. Telephone: (978) 934-2410. Email: mathematics@uml.edu

You might also wish to contact our Office of Alumni Relations, Southwick Hall 250, UML North, Lowell, MA 01854-3629. Toll free telephone: (877) UML-ALUM. Email: Alumni_Office@uml.edu

UML Mathematical Sciences Online

Have you visited Mathematical Sciences web page lately? Our new address is <http://faculty.uml.edu/math>
Have you lost your past issues of *Tangents*? Go to the alumni section of the UML Math web page for links to back issues.

You can follow us on Twitter:
<http://twitter.com/UMassLowellMath>.

The Tangents Problem

The Tangents Problem
The following problem was suggested by Peter Price, one of Steve Pennell's handball-playing friends.

Consider the integer 1,052. It comes close to having an interesting property. If you take its units digit and move it to the leftmost position, you get 2,105, which is very nearly double 1,052. Find the smallest positive integer with the property that if you move the units digit to the front position you exactly double the original integer.

Up to four correct solutions from among all that are submitted by February 1, 2010 will earn the solver a "UML Math" T-shirt. You may submit your solution to mathematics@uml.edu or mail it to Ken Levasseur, Department of Mathematical Sciences, North Campus/Olney Hall, UMass Lowell, Lowell MA 01854.

The Spring 2008 problem

This problem is still open. If you have a solution, feel free to submit it. We will post a solution later in the school year on the UML Math web site.

The following problem is adapted from a problem on Project Euler (<http://projecteuler.net>).

Twenty-one balls of radii 20 mm, 21 mm, ..., 40 mm are packed into a pipe of internal radius 40 mm.

- (a) If the balls are packed in order of size, from largest to smallest, how long must the pipe be in order to fully contain the balls?
- (b) What is the shortest length of pipe that fully contains the balls if the balls can be packed in any order?

Give your answer in micrometers (10⁻⁶ m) rounded to the nearest integer.

Campus News

Congratulations to junior math major Angus MacDonald and the rest of the UML men's cross-country team. The team won the New England championship earlier this month. Angus was the top runner for UML, finishing eighth in a field of 320 runners from 47 Division 1, 2, and 3 schools.

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The University recently purchased the former DoubleTree hotel in downtown Lowell for use as a dormitory, inn and conference center. It will be the site of our next Alumni Reception and Awards Banquet.

Thanks For the Contributions!

Our thanks to all who have contributed to the Department of Mathematical Sciences over the past few years. Your generosity has allowed us to make purchases, award scholarships, and engage in activities that would otherwise have been impossible.

Many of you have responded generously to UML phonathon and other fundraising contacts. These requests can benefit the Department of Mathematical Sciences directly if you specify that you wish to have your gift directed to Mathematics. Otherwise it will provide valuable assistance to the University at the College level.