

# Tangents

Spring 2004

News from the Department of Mathematical Sciences  
University of Massachusetts Lowell

## Math Alumni in Education

**I**n this issue we are featuring math alumni who are making a mark in mathematics education.

**Carol (Boughner) Rychlik**, (B. S., 1993) I am currently teaching at Thomas Jefferson School for Science and Technology in Alexandria, Va., Fairfax County Public Schools. I teach Algebra 2 with trigonometry, multivariable calculus and linear algebra. I am a National Board Certified mathematics teacher for secondary education. Last year, I was a finalist for Teacher of the Year for Fairfax County Public Schools in Virginia. I was chosen to be on a team

of math teachers as a delegation to China in June 1999. We were there for two days and shared the United States' math educational system with them and they shared their system with us. One of the leaders was Lee Stiff, who was the President-Elect for NCTM, National Council for Teachers of Mathematics. I can be reached at carol.rychlik@fcps.edu I look forward to hearing from other alumni.

**Nancy (DiPaolo) McLaughlin** (M. S., 2002) I am currently a secondary mathematics curriculum leader in Lawrence. I started my coursework at UML as a participant in the Building Regional Capacity project.

*Continued on back page*

## Math in the News

**H**ere are some sightings of mathematical items appearing in the news. If you find an amusing item, let us know and we may put it in the next newsletter.

On Dec. 11, 2003 *The Boston Globe* had the following headline: **Largest Prime Number (6.3 m Digits) Discovered**. That's funny. I didn't think there was a largest prime number. The article highlights the method of discovering this largest known prime (a Mersenne Prime) which involved distributing the work of primality testing to computer users on the Internet.

This is an "odd" occurrence of math in our food as reported on CNN/Money (Jan 29, 2004): **Hormel Finds Calculator Parts in Chili**: Food maker says about 104,000 lbs of canned chili with meat may be tainted by calculator parts.

A couple of amusing items from the October *Chance Newsletter* out of Dartmouth College:

**Earning Airpoints**: Unlike most other frequent flyer programmes where points are based on miles, Airpoints is based on kilometers. In fact, you're earning up to 60% more points than other frequent flyer

programmes... (Letter from Air New Zealand, October 2002)

After the menopause, women's risk of heart disease is similar to men's. One woman in six dies of it every year. (Medical editor, *The Daily Telegraph*, 15 July 2003)

In his monthly column for ABC News on Jan 1, 2004, John Paulos (author of *Innumeracy*) proposed the presidential candidates should know some math and he offered (to moderators) the following list of 10 questions (How well would you do?):

1. A crucial number to know is the population of the country of which you want to be president. What is the approximate population of the United States? Of the world? What percentage of the latter is the former?
2. A news article claims that 15 percent of all strokes occur some time between noon and midnight on either Friday or Saturday, perhaps because of increased celebrating on the weekends. Do you check with the Centers for Disease Control? Do you stop campaigning on weekends? What's your reaction to this statistic?

*Continued on page 3*

## Mathematical Sciences Scholarships

The Mathematical Sciences Department is pleased to announce that the number of scholarships and awards available to students in our major has increased. Many years ago, an award in memory of Prof. Mary Hall was established by Professor Emeritus Thomas Kudzma. In more recent years, through the generous contributions of Mary and Russ Bedell, the Richardson-Bedell scholarship was established. This year, the department received a most generous gift from Arthur Zamanakos.

Mr. Zamanakos made the donation to the department because of his experience with faculty from the predecessor institution, Lowell Technological Institute. He was taking Continuing Education courses at Fort Devens in the late 1940s and was very impressed by the quality of the education he received. As a result of this, he has donated \$200,000 to be used for scholarships for math majors.

# Kiwi's Korner



James Graham-Eagle

W

elcome to the sixth edition of *Tangents*. It has been an unusually quiet semester so far and I hope it continues this way.

Thanks in large part to the efforts of Assoc. Prof. Shelley

Rasmussen, the number of mathematics majors has been steadily increasing over the last couple of years. And now, thanks to a generous donation from Dean Robert Tamarin and some hard work from Prof. Ruth Tanner in chemistry, these majors have a place close to the department where they can work and relax. The new Mathematics/Chemistry Undergraduate Room is well-equipped with comfortable furniture and PCs running mathematics and chemistry software. Also the new Math PC lab is finally up and running. This semester there are three courses using the lab—Statistical Programming using SAS, Probability and Statistics II and TEX for the Senior Seminar students.

The Mathematical Competition in Modeling (MCM) run annually by the Consortium for Mathematics and its Applications (COMAP) took place over the weekend of Feb. 6. This competition gives teams of three undergraduates 96 hours to research

and complete a written report on either of two specified problems. You can get a copy of this year's problems at [www.comap.com/undergraduate/contests/mcm/contests/2004/problems](http://www.comap.com/undergraduate/contests/mcm/contests/2004/problems).



This year we had two teams take part in the competition: Jeremy Achin, Tim Owen and Brian Krejca; and Patrick Joyce, Brian Petrowicz and Alex Smith. Both teams selected Problem B which asked for an implementation of a quick pass system at an amusement park. In all six hundred teams from eleven countries took part. Special congratulations go to Jeremy, Tim and Brian whose report was ranked Meritorious putting them ahead of teams from the University of Michigan, Cornell, Northwestern, Worcester Polytechnic and Boston University.

This year the department received a substantial gift from Arthur Zamanakos who fondly remembered several UML math faculty from courses he took many years ago at Fort Devens. This gift has been used to establish the Arthur Zamanakos Endowed Scholarship, which will be awarded annually, beginning next year, to two outstanding junior or senior mathematics majors. I wish also to individually thank Mary and Russell Bedell who, in addition to funding an endowed scholarship, continue to donate to the department on a regular basis; and Gary Madison who has been very generous over the past few years. Given the reduction of operating funds from the state, these contributions play an increasingly important role in helping us maintain a quality program here.

By the time you read this, we will have held our annual Alumni Reception and Awards dinner on April 23 at the Brewery Exchange. Photo of the event have been posted on the math alumni page, [www.uml.edu/dept/math/alumni.htm](http://www.uml.edu/dept/math/alumni.htm).

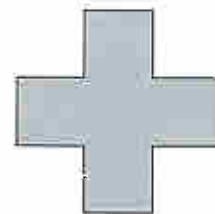
Kiwi

## The Mathematical Sciences Web Page

Have you visited Mathematical Sciences Web page lately? The address is <http://www.uml.edu/dept/math>. Be sure to check out the UML WebMathematica page, where you can explore and review a wide variety of math topics. A link appears on the left side of the main page.

## The Problem

It is easy to use 12 matches to make a polygon of area 5 (see diagram). Can you use 12 matches to make a polygon of area 4? To make it more interesting, each vertex of the polygon must be at a point with integer coordinates (where the matches have unit length). Note: It must be a true polygon, with no crossings.



Three correct solutions from among all that are submitted by August 31, 2004 will earn a "Math Challenge" t-shirt.

### Solutions to previous problems

*Fall 2003: Given five points on a sphere, prove that there are four of them that lie on the same closed hemisphere.*

Solution by Andrew Golay (B. S. 2003) who is proudly wearing his "Math Challenge" T-shirt this spring: There can be a great circle constructed through any two points on a sphere, because any three points in 3-space are coplanar, and by definition a great circle is the intersection of a sphere and a plane passing through its center. Define a sphere  $S$ , and the first two of the five points  $P_1$  and  $P_2$ . Then let great circle  $E$  be constructed through  $P_1$  and  $P_2$ . Define the closed hemispheres  $U$  and  $D$  on  $S$  such that  $U \cap D = E$ . Remark:  $P_1$  and  $P_2$  are in both hemispheres. Now you have three remaining points and by the pigeonhole principle, two of them are in  $U$  or  $D$ . Therefore, at least four of the points are in the same hemisphere.

Spring 2003: Kiwi has proven that one need only turn over 11 cards to find a relative minimum. The proof is a bit too long for this newsletter so it will be posted on the department Web page—look in the alumni section.

James Graham-Eagle, Chair

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## Math in the News

3. You must understand the electoral process, of course, so given the way the Electoral College is set up, what is the theoretically smallest number of actual votes (not electoral votes) a candidate can receive and still be elected president?
4. Approximately how many Americans died in the attacks on 9/11? There's no moral comparison, of course, but approximately how many die in auto accidents annually? From heart disease annually?
5. You're campaigning in a state in which the percentage of employees who subscribe to a particular drug plan has risen one percentage point, from 1.5 percent to 2.5 percent. By what percent has this figure risen? By what percent must it fall to return to its former level?
6. In Disproportia, a small Midwestern town, the average tax cut per household is \$2,200, but the median tax cut is \$150. What does this say about the distribution of taxable incomes in the town? If the founder of a high-tech company were to move into the community, which is more likely to rise, the mean or the median tax cut?
7. Roughly how big is the federal budget? What fraction of it is discretionary and non-military? By contrast, what is the gross domestic product (to the nearest trillion dollars)?
8. If the government spends \$1,000 per second, it will take approximately 17 minutes to spend \$1 million. At this rate, about how long will it take to spend \$1 billion? How long to spend \$1 trillion? One comparison: The \$87 billion supplementary budget for Iraq is approximately how many times the annual U.S. contribution to the U.N.?
9. An ace pollster on your staff claims that 63.86 percent of 100 Americans surveyed support your foreign policy. What's your reaction to these numbers?
10. If FAWUA, the federal agency with an unpronounceable acronym, deposits \$1 billion in an escrow fund at 7 percent, how long until the deposit is worth \$2 billion? \$4 billion? Alternatively, if the agency borrows \$1 billion at 7 percent and makes no payments on it, how long until it owes \$2 billion? \$4 billion?

For the answers follow the link [http://abcnews.go.com/sections/scitech/WhosCounting/whoscounting\\_paulos\\_candidates\\_040104.html](http://abcnews.go.com/sections/scitech/WhosCounting/whoscounting_paulos_candidates_040104.html).

## 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.

## Faculty Update: Joyce Williams

**J**oyce Williams retired from the department in the spring of 1996, having begun her career as a professor in 1967. During her years of full-time service, she taught every calculus sequence course along with complex variables, FORTRAN, PASCAL and Assembly Language computer courses. Currently, Joyce continues to teach a summer course she developed, entitled The History of Mathematics, to both undergraduate and graduate students.

As a resident of Littleton, Joyce lives on a rural setting with a 60 acre farm/orchard. She serves as treasurer for the First Church Unitarian of Littleton where she is a vocalist in the choir. Among the many activities Joyce enjoys are those involving her four children, nine grandchildren and four great-grandchildren.

One of her sons and a grandson are serving in Iraq. Her interest in genealogy has seen her researching family roots. It is interesting to note that



two of her ancestors were mathematics professors, an aunt and a grandfather who taught in the Dakotas during the late 1800s

We are always pleased to see Joyce when she teaches and visits at the University as she continues to display her kind and pleasant disposition.

## Math Alumni in Education

This led me to the masters degree program. I believe it is important for math educators to facilitate student learning, allowing students to make sense of mathematics using their own prior knowledge and for educators to be cognizant of multiple intelligences while they differentiate instruction. Our district is privileged to be a part of the Focus on Math (FOM) (<http://focusonmath.org/>), a National Science Foundation MSP grant that partners university math professors with five urban school districts in Massachusetts. It is exciting to be part of NSF initiatives and curricula that will increase the level of enjoyment in mathematics for all, undoubtedly increasing the number of mathematically literate citizens.

**John Tucker** (B. S. 2003) For seven months I have been teaching middle school mathematics in an urban district just north of Boston. It has been a fascinating, challenging, frustrating and rewarding experience. The challenge comes from trying to find a way to engage all

my students. There are some capable young people in my classes, and it is a pleasure to tell them things they do not yet know. The frustration is due to my as yet under-developed capability to explain the mathematical concepts to those not yet ready to own them. The fascination comes from the exposure to a hundred different minds, all bringing their own history, ability and perspective to the topics we discuss. The reward comes when I see a young person work through the idea, when they say, "This is easy." I treasure each of these moments. I can be reached at [JTucker@malden.mec.edu](mailto:JTucker@malden.mec.edu)

Following up on recent doctorates awarded to our alumni, we heard from **Andrew "Phred" Fredricks** (M. S., 1994). He earned a Ph.D. from RPI in August 2000 and is now a mathematician at NUWC (Naval Undersea Warfare Center), Newport, RI. His Web site is <http://home.comcast.net/~fredra/>

## This Year in Mathematics History Mod 10, 100

**I**t is 890 years since the birthday of Bhaskaracharya, considered the greatest of medieval Indian mathematicians, and one of the inventors of algebra. Eight hundred years later we come to the birthday of George Dantzig, who invented the simplex method for linear programming while working on logistics problems for the U.S. Army during World War II. Dantzig is now considered the founding father of operations research.

This year marks the 200th anniversary of Bunyakovsky, who discovered the Cauchy-Schwarz inequality well before Cauchy and Schwarz. Unfortunately, Bunyakovsky seems best known for our neglect; we seldom name that famous inequality after him. Even in mathematics life can be unfair. Speaking of which, this year is also the 100th anniversary of Witold Hurewicz, pioneer of algebraic topology and inventor of higher homotopy groups, who died during a hike at a mathematics con-

ference in Mexico, after falling from an Aztec pyramid.



Viktor Bunyakovsky

On a happier note, this year marks the 50th birthdays of Field Medalist Jean Bourgain and wavelets pioneer Ingrid Daubechies, as well as the 60th birthday of combinatorialist Richard Stanley. A conference in Stanley's honor is being held at MIT this June.

Those interested in the history of mathematics might enjoy the following sites and sources for this article:

1. E.T. Bell, *Men of Mathematics*, Touchstone Books, 1986.
2. Phillip J. Davis and Reuben Hersh, *The Mathematical Experience*, Houghton Mifflin, 1999.
3. Dirk J. Struik, *A Concise History of Mathematics*, Dover, 1987.
4. <http://www-history.mcs.st-andrews.ac.uk/history/>
5. <http://www.math.ucsd.edu/~stanfest/>

### 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'll add it to the UML Math Alumni page on the Web: [www.uml.edu/dept/math/alumni.htm](http://www.uml.edu/dept/math/alumni.htm). In addition, we have a distribution list for math alumni news. To subscribe, send a message to [majordomo@u Lowell.uml.edu](mailto:majordomo@u Lowell.uml.edu) with the text "subscribe uml-math-alumni your\_email\_address" in the body of the message

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