

Five New Lecturers Hired for Spring 2012

The department has filled five Lecturer positions that started in the Spring 2012 semester. They have been hired to teach the growing number of calculus and management calculus sections at UMass Lowell. They have provided the following short biographies.

Dimitris M. Christodoulou graduated in 1989 from Louisiana State University with a Ph.D. degree in Physics. The middle initial letter M is what distinguishes him in published literature from the "other" renowned Dimitris Christodoulou.

Always interested in teaching the material that he learned and refined over the years, Dimitris volunteered teaching Physics and Astronomy courses in his postdoctoral years and continued teaching theoretical courses in Mathematics and Computer Science at UML and BU. Amongst these competing disciplines, Mathematics finally won him over. Dimitris is obsessed with teaching students novel techniques in applied math and this is the real reason that he will never retire from teaching.

In his spare time, Dimitris is also trying hard to get advanced students involved in original research. His research interests (beliefs) include nonlinear differential equations (even when they have to be solved by expensive numerical multidimensional simulations), the formation of stars (just another "boring" phase transition) and the solar system (squarely against planet migration), jets emanating from the nuclei of distant galaxies (and their mini versions ejected from nearby X-ray binary stars), and dark matter in the universe (if we can't see it, then either it's hiding from us too well or ... it's not there!).



Dimitris M. Christodoulou



Jennifer Gonzalez-Zugasti

Jennifer Gonzalez-Zugasti writes "I attended Wellesley College, where I received a BA in mathematics and a minor in physics. My undergraduate thesis was titled *Applications of Modular Forms to Number Theory*, and most of the material in the thesis was suggested in Neal Koblitz's *Introduction to Elliptic Curves and Modular Forms*. While an undergraduate, I spent a summer at the University of Oklahoma as an NSF summer

research program fellow, working on developing Pascal software to aid research of algebraic concepts.

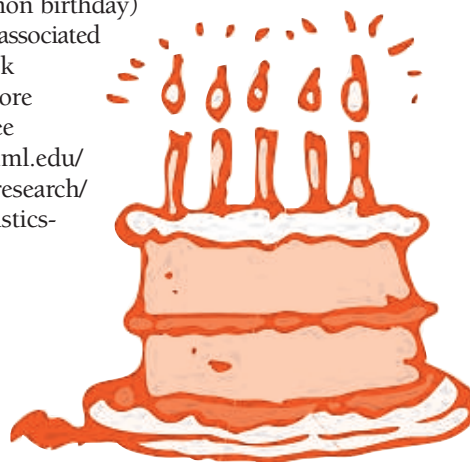
Birthday Attacks

Recall the rather surprising Birthday Paradox: if you ask people their birthdays then two will have the same birthday after an average of only $\sqrt{365\pi/2} \approx 24$ queries, or $\sqrt{N\pi/2}$ queries on a planet with N day years. A Birthday Attack involves the use of a generalized Birthday

Paradox to solve a difficult math problem related to cryptography and code-breaking. Many codes, for instance, are easily broken if the discrete logarithm problem can be solved: given integers $g, h \in \{1, 2, \dots, M-1\}$ find an exponent k with $g^k \equiv h \pmod{M}$, if one exists, for instance $k = 3$ is a solution to $7^k \equiv 2 \pmod{11}$. In 1978 John Pollard gave one of the first Birthday Attacks, a method for computing discrete logarithm which still forms the basis of the fastest method known for breaking some codes. Consequently, understanding how generalizations of the Birthday Paradox work can aid in optimizing such attacks.

Recent work of Professor Montenegro gives a remarkably sharp heuristic for predicting the average number of steps (birthday queries) required for Pollard's attack. A back-of-the-envelope calculation suffices to give an estimate within 1.5% of simulation data, while a longer computation requiring a computer gives an estimate within 0.1% of simulations. From the algorithmic design perspective the accuracy of this heuristic shows, rather counterintuitively, that if two independent runs of the Birthday Attack process are started from the same value (birthday) then the faster they are expected to intersect each other (reach a common birthday)

the slower the associated Birthday Attack will be. For more information see <http://faculty.uml.edu/rmontenegro/research/birthday-heuristics-tangents.pdf>.



Spring break has arrived, much to everyone's delight. The break seems to have come early this year—I'm still waiting for winter to begin.

The department is happy to welcome five new full-time faculty members: Dimitris Christodoulou, Jennifer Gonzalez-Zugasti, John Lahoud, Theresa Schille, and Thao Tran. Dimitris, Jennifer, John, and Theresa have been part-time faculty members for years; and Theresa is an alumna. Thao recently completed her Ph.D. at Northeastern University. All five are great additions to the faculty.

Congratulations to Professor Alex Samarov, who will retire at the end of this semester. We will miss you, Alex.

Congratulations to Professor Jim Propp, who was awarded the very prestigious Chancellor's Professorship at UC Berkeley for the spring 2012 semester. This visiting professorship will permit him to participate in a special semester at the Mathematical Sciences Research Institute on random spatial processes, while also teaching a graduate course in this area.

Thank you to Professor Shelley Rasmussen for lending the department a beautiful tapestry that she wove. It adds a great deal to the look of the department office. A photo would not do it justice—you need to stop by to see it.

The university is embarking on two exciting new initiatives: UTeach (described in the Fall 2011 issue of *Tangents*) and an expanded cooperative education program. Professor Levasseur is one of the two faculty members leading the UTeach program. Undergraduate math majors (and other science and engineering majors) who complete the program will be certified to teach their major subject at the middle or high school level in Massachusetts upon completion of their bachelor's degree. The staff of the Career Services and Cooperative Education Center are formalizing and expanding the opportunities for co-op positions. Math majors can now apply to participate in a co-op position during the summer after their junior year.

Our fall graduates were Timothy Belley, JiaYing Chen, Jason Doole, Brian Dukes, Cory Fournier, Adam Lanoue, and Tracey Moulaison. Congratulations to all the graduates.

April is Math Awareness Month. This year's theme is Mathematics, Statistics, and the Data Deluge. For more information, go to <http://www.mathaware.org> or google "Math Awareness Month."

I hope everyone had a happy Pi Day on 3.14. If you missed it, you can always celebrate on 6.28. Depending on your preference for the discrete or continuous, it is either Perfect Day (6 and 28 are the smallest perfect numbers) or Tau Day (tau is the symbol for $2\pi = 6.28\dots$).

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. If you can, please join us for our annual Alumni Reception/Student Awards Ceremony on May 4 at UML's Inn and Conference Center.



Steve Pennell

The *Tangents* Problem

The Spring 2012 Problem: Let $h(x) = 1/x$. Consider all partitions of the interval $[1, 2]$ into four subintervals of any size determined by three interior points $x_1, x_2,$ and x_3 . For each such partition, the integral of $h(x)$ from 1 to 2 can be approximated by *lower sums* where the height of each inscribed rectangle below the curve $y = h(x)$ is the value of h at the right endpoint of the corresponding subinterval. Find the partition that maximizes the value of the lower sum.

Up to four correct solutions from among all that are submitted by September 1, 2012 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.

Solution to Fall 2011 Problem: The Coin Problem.

Imagine $2N+1$ coins laid out on a line, with one coin at each integer between $-N$ and N . Start by pointing at the coin at 0 with your left index finger, and then iterate the following rule: use your right hand to turn over the coin that your left hand is pointing at, and then move your left hand either 1 step to the right or 1 step to the left according to whether the coin you just turned over shows Heads or Tails. Eventually you will be pointing at either $N+1$ or $-N-1$ (where there is no coin, so the game ends). In the case where you end up pointing at $N+1$, what can be concluded about the net increase/decrease in the number of coins that show Heads, from the start of the game to its end? What about in the case where you end up pointing at $-N-1$?

Solution by Donna Dietz (M. S., UML, 1995; Ph. D., RPI, 2002). If you end up at $(N+1)$ you have "stepped" a net $(N+1)$ spots to the right. This means $(N+1+k)$ times a Tail has become Heads, and (k) times, a Head has become a Tail. Thus, you have $(N+1)$ more Heads than before. By symmetry, if you land at $(-N-1)$, you have $(-N-1)$ more Tails than before.

Donna also submitted a correct solution to The Grasshopper Puzzle. (The Spring 2011 problem), but it is too long to fit into this issue, even if we wrote in the margin! The proposer's solution can be viewed at <http://faculty.uml.edu/jpropp/ruin-solution.html>.

Steve Pennell, Chair

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

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

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“After Wellesley, I went to the University of Washington and received an MS in Mathematics. While there I was a teaching assistant. I began as a TA, but soon was teaching my own courses in Precalculus and Calculus.

“After leaving UW, I worked for The Wyatt Company as a recordkeeper, where I stayed for 10 months. Then my husband and I spent the next 16 months traveling. We visited many countries, including Nepal, Thailand, Malaysia, Indonesia, Norway, Wales, England, Chile, and Argentina (where my husband is from).

“Upon returning to the US, I took a job with Dreyfus Retirement Services, where I began once again as a recordkeeper. I remained with DRS for four and a half years, during which time I became a Sr. Implementation Specialist. Essentially I was a project manager and an internal consultant. I enjoyed my job because I worked directly with clients and I also worked with every department within DRS/Mellon.

I left my job to stay at home with my two children. But after a few years I grew restless and began taking Information Technology courses at UML. I graduated with a BA in Information Technology. When I went for my exit interview I met Prof. Bernard Shapiro, who suggested that I apply for an adjunct position in the mathematics department at UML. I began as an adjunct in September of 2009.”

John Lahoud taught at the high school level for almost ten years before returning to school to pursue a Master’s Degree in Mathematics. That decision led to 14 years as an adjunct instructor in Mathematics at UMass Lowell, followed by his appointment this year as a full-time lecturer. Who would have guessed that this “jumpin’ jock from Slippery Rock” (BS in Health and Phys Ed, Slippery Rock State College, 1977) would land here? It was certainly one long leap, especially for a guy with such short legs.



John Lahoud

Since beginning his teaching duties at UML in January of 1998, Lahoud has taught College Algebra, Mathematical Perspectives, Management Precalculus, Management Calculus, and, for the better part of the last ten years, Calculus I. In the process he has met many great people and made many good friends—both colleagues and students—and he has rekindled an old love, for the game of handball, which he first picked up while working as a Health and Fitness Supervisor in Philadelphia in 1982. It turned out that Professor Pennell in the Math Department was (and still is) an avid player, and the ongoing rivalry has been a highlight of each work week for more than a decade.

In addition to handball, Lahoud also enjoys daily long runs and weight-training sessions, though the pace is slower and the weights lighter than they used to be. On a more cerebral note, his reading includes daily doses of the Bible and Christian theology, non-fiction books (mostly stories of survival against incredible odds), conservative political works, and some occasional superhero fare.

Chief among his goals is to become as good a teacher as the professors among whom he works, that he might one day be worthy of the position to which he has been appointed. He considers himself one blessed guy: “The Lord is good.”

Theresa Schille (Saracusa) graduated from UMass Lowell in 1994 with a MS in Mathematics with a concentration in Applied Math. Since graduation she worked at Raytheon validating software for the Patriot missile. She has been teaching for UMass Lowell Continuing Studies and Corporate Education part-time since 1994. She is thrilled to be teaching Calc 1B for the Math Dept this semester!



Theresa Schille (Saracusa)

Thao Tran received a B.S degree from the University of Florida, a M.S. from MIT, and a Ph.D. from Northeastern University, all in mathematics. Her doctoral research was in cluster algebras, a topic at the intersection of combinatorics and algebra. Prior to coming to UML, she taught math for several years at Northeastern while working on her degree. This is her first semester at UML, and she is enjoying the experience very much. Her hobbies include listening to music and cooking.



Thao Tran

UMass Lowell Mathematical Sciences Online

Have you visited Mathematical Sciences web page lately? Our address is <http://faculty.uml.edu/math>

Have you missed any 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>.

Will Clark: First Graduate of the Industrial Mathematics PSM

In 2010, the UMass system launched an initiative to offer several Professional Science Masters programs on each of the system campuses. The Industrial Mathematics program became one of the first to be approved in that year. Fast forward to the end of the Fall 2011 semester and the first three UMass PSM degrees were awarded. One of them went to Mr. William Clark. Will completed a science cluster in epidemiology and interned with the New Hampshire Department of Health, and has since worked on statistical analyses with researchers at the UMass Medical School. Well done, Will!

Applications and enrollments in PSM programs across the system have been increasing, and we hope to report on several more graduates in the coming years. The Industrial Mathematics PSM program is an affiliate of the Professional Science Master's Association (www.sciencemasters.com).



Will Clark

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 fundraising contacts. These contributions 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.

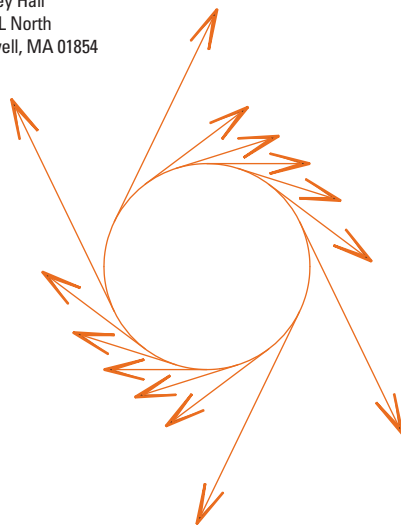
What Are You Up To?

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

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